

Hoechst Celanese

Chemical Group

Hoechst Celanese Corporation
Bay City Plant
PO Box 509
Highway 3057
Bay City, TX 77404-0509

May 9, 1994
IOC-043-94

FEDERAL EXPRESS MAIL - 8635790590

Mr. Ben K. Knappe - Head
UIC Team
UIC, Uranium and Radioactive Waste Section
Industrial and Hazardous Waste Division
Texas Natural Resource Conservation Commission
P. O. Box 13087
1700 North Congress Avenue
Austin, Texas 78711-3087

Subject: WDW-49 (PLANT WELL NUMBER 4)
WORKOVER AND MECHANICAL INTEGRITY TESTING REPORT
HOECHST CELANESE CHEMICAL GROUP, INC.
BAY CITY PLANT, BAY CITY, TEXAS

Dear Mr. Knappe:

Two copies of the Workover and Mechanical Integrity Testing report on WDW-49 are enclosed. These reports are provided for your review and approval. As you are aware, the workover and mechanical integrity testing were performed between March 3rd and March 18, 1994 by our Contractor, ECO Solutions, Inc.

Please contact me at 409/241-4197 or Mr. Ray Horton at 409/241-4076 if you have comments or questions about the report.

Very truly yours,

I. O. Coleman, Jr.
I. O. Coleman, Jr.

cc: Mr. Laurence G. Walker - w/o report
UIC Team
Industrial and Hazardous Waste Division
Texas Natural Resource Conservation Commission
P. O. Box 13087
Austin, Texas 78711-3087

Mr. Phil Dellinger (CERTIFIED MAIL) - w/ report
Underground Injection Control Program
Environmental Protection Agency
1445 Ross Avenue, Suite #1200
Dallas, Texas 75202-2733

Hoechst 

Chemical Group
Hoechst Celanese Corporation
Bay City Plant
PO Box 509
Highway 3057
Bay City, TX 77404-0509

April 27, 1994
IOC-038-94

CERTIFIED MAIL

Mr. Ben K. Knappe - Head
UIC Team
UIC, Uranium and Radioactive Waste Section
Industrial and Hazardous Waste Division
Texas Natural Resource Conservation Commission
P. O. Box 13087
1700 North Congress Avenue
Austin, Texas 78711-3087

Subject: PRESSURE FALLOFF MECHANICAL INTEGRITY TESTING
(MIT) REPORT FOR WDW-110

Dear Mr. Knappe:

Enclosed are two copies of the Pressure Falloff and MIT report for WDW-110 which are provided for your review and approval. As you are aware, the testing occurred between February 21st and March 28th, 1994 and was performed by our Contractor, ECO Solutions, Inc., Houston, Texas.

Please don't hesitate to contact me at 409/241-4197 if you have comments and/or questions concerning the report.

Very truly yours,

I. O. Coleman, Jr. /cjs

I. O. Coleman, Jr.
Environmental Section Leader

IOC/cjs
attachment

cc: Mr. Laurence G. Walker, Geologist
UIC Team
Industrial and Hazardous Waste Division
Texas Natural Resource Conservation Commission
P. O. Box 13087
Austin, Texas 78711-3087

Mr. Phil Dellinger - **CERTIFIED MAIL** - w/report
Underground Injection Control Program
Environmental Protection Agency
1445 Ross Avenue, Suite #1200
Dallas, Texas 75202-2733

Chemical Group

Hoechst Celanese Corporation
Bay City Plant
PO Box 509
Highway 3057
Bay City, TX 77404-0509

April 26, 1994
IOC-037-94

CERTIFIED MAIL

Mr. Ben K. Knape - Head
UIC Team
UIC, Uranium and Radioactive Waste Section
Industrial and Hazardous Waste Division
Texas Natural Resource Conservation Commission
P. O. Box 13087
1700 North Congress Avenue
Austin, Texas 78711-3087

Subject: PRESSURE FALLOFF MECHANICAL INTEGRITY TESTING
(MIT) AND FALLOFF REPORT FOR WDW-14

Dear Mr. Knape:

Enclosed are two copies of the Pressure Falloff and MIT report for WDW-14 which are provided for your review and approval. As you are aware, the testing occurred between February 16th and February 22nd, 1994 and was performed by our Contractor, ECO Solutions, Inc., Houston, Texas.

Please don't hesitate to contact me at 409/241-4197 if you have comments and/or questions concerning the report.

Very truly yours,

I. O. Coleman, Jr. / cjs

I. O. Coleman, Jr.
Environmental Section Leader

IOC/cjs
attachment

cc: Mr. Laurence G. Walker, Geologist
UIC Team
Industrial and Hazardous Waste Division
Texas Natural Resource Conservation Commission
P. O. Box 13087
Austin, Texas 78711-3087

Mr. Phil Dellinger - **CERTIFIED MAIL** - w/report
Underground Injection Control Program
Environmental Protection Agency
1445 Ross Avenue, Suite #1200
Dallas, Texas 75202-2733

4
4/2/94
APR 14 1994

CERTIFIED MAIL Z 013 011 515 RETURN RECEIPT REQUESTED

Mr. I. O. Coleman, Jr.
Hoechst Celanese Corporation
Bay City Plant
P. O. Box 509
Highway 3057
Bay City, Texas 77404-0509

Dear Mr. Coleman:

We have completed the review of the pressure falloff test conducted in November 1993 for well WDW-32. Based on this review, the EPA has determined that Hoechst Celanese Corporation has fulfilled Petition Approval Condition No. 8 for the year May 4, 1993, to May 4, 1994.

If you have any questions or comments please contact Joe Kordzi at (214) 655-7186 or Phil Dellinger at (214) 655-7142.

Sincerely yours,

Mac A. Weaver, P.E.
Chief
UIC State Programs Section (6W-SU)

cc: Ben Knape, TNRCC

6W-SU:4/7/94:HOWARD:H:\LBAN\WP50\CELANESE\CELANESE.BA\FLOFFAPR.93
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R E C O R D O F C O M M U N I C A T I O N

TO: Celanese Bay City File

FROM: Phil Dellinger

DATE: February 23, 1994

TYPE OF COMM: Phone Call

SUBJECT: Mechanical Integrity Test for WDW-14

SUMMARY: Tom Jones of Eco Solutions, Inc. called to report that the mechanical integrity testing on Celanese Bay City Well WDW-14 indicated a hole in the casing below the packer and the well had been shut in. I told him to send the testing info to us soon.

CONCLUSION, ACTION TAKEN OR REFERRED:

FILE COPIES TO:

4

Chemical Group

Hoechst Celanese Corporation
Bay City Plant
PO Box 509
Highway 3057
Bay City, TX 77404-0509

February 2, 1994
IOC-013-94

CERTIFIED MAIL

Mr. Mac A. Weaver, P. E., Chief
UIC State Programs Section (6W-SU)
United States Environmental Protection Agency
Region 6
1445 Ross Avenue, Suite 1200
Dallas, Texas 75202-2733

Subject: Response To NOD Letter Dated January 12, 1994
Class I Injection Well Permit, No. WDW-32
Hoechst Celanese Chemical Group, Inc.,
Bay City Plant, Bay City, Texas
(Attachment I, NOD Letter Dated 1/12/94 Enclosed
For Your Quick Reference)

Dear Mr. Weaver:

Enclosed in report format is our response to your request for additional information relative to the 1993 annual report previously submitted for WDW-32. This report is provided for your consideration and approval.

I can be contacted by telephone at 409/241-4197 if you have any comments and/or questions concerning the information in the report.

Very truly yours,

I. O. Coleman, Jr. / cjs

I. O. Coleman, Jr.

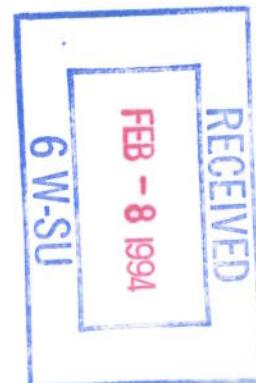
IOC/cjs
attachment



2/2/94

cc: Mr. Joe Kordzi
 UIC State Programs Section (6W-SU)
 U. S. Environmental Protection Agency
 1445 Ross Avenue, Suite 1200
 Dallas, Texas 75202-2733

Mr. Ben Knape, Chief
 UIC Section
 Texas Natural Resource Conservation Commission
 P. O. Box 13087, Capitol Station
 Austin, Texas 78711-3087





UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION 6
1445 ROSS AVENUE, SUITE 1200
DALLAS, TX 75202-2733

January 12, 1994

CERTIFIED MAIL P 873 011 248 RETURN RECEIPT REQUESTED

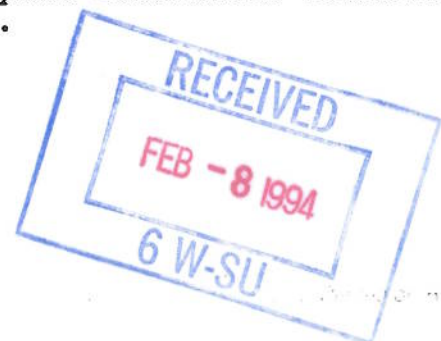
Mr. I. O. Coleman, Jr.
Hoechst Celanese Corporation
Bay City Plant
P. O. Box 509
Highway 3057
Bay City, Texas 77404-0509

Dear Mr. Coleman:

Your 1993 annual report for WDW-32 has been reviewed. Please provide the following by February 10, 1994:

1. A detailed summary of events in real time. This should include information on the following: the length of the injection period prior to falloff, rate changes including any that occurred during running of the gauges, problems encountered, etc.
2. A discussion of how the falloff testing was analyzed, including what software was employed, the type of simulation that was performed, assumptions, etc.
3. Worked through calculations, with appropriate explanative text for t_p , the injection period; the time to exit the waste front; the flowing bottomhole pressure; and radius of investigation.
4. A comparison of the static and flowing bottomhole pressures with those predicted by the petition.

In general your report lacks any explanative text and is merely a summary of the data and well analysis. This type of presentation makes it extremely difficult to review your well test. In addition, many of the above comments are covered in the "Pressure Falloff Testing Guideline, First Revision", which was sent to you several months ago. Please ensure that your contractor follows this document in conducting future tests.

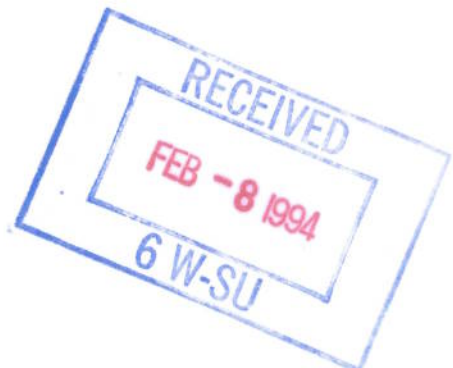


If you have any questions, please contact Joe Kordzi at (214) 655-7186 or Phil Dellinger at (214) 655-7142.

Sincerely yours,



Mac A. Weaver, P.E.
Chief
UIC State Programs



4
JAN 12 1994

CERTIFIED MAIL P 873 011 248 RETURN RECEIPT REQUESTED

Mr. I. O. Coleman, Jr.
Hoechst Celanese Corporation
Bay City Plant
P. O. Box 509
Highway 3057
Bay City, Texas 77404-0509

Dear Mr. Coleman:

Your 1993 annual report for WDW-32 has been reviewed. Please provide the following by February 10, 1994:

1. A detailed summary of events in real time. This should include information on the following: the length of the injection period prior to falloff, rate changes including any that occurred during running of the gauges, problems encountered, etc.
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J. K. 1/11/94
6W-SU:1/10/94:KORDZI:MH:H:\LBAN\WP50\CELANESE\CELANESE.BA\
CEL BAY93.ANL
6W-SU 6W-SU
DELLINGER WEAVER

PD 1/11/94 mw 1/11/94

If you have any questions, please contact Joe Kordzi at (214) 655-7186 or Phil Dellinger at (214) 655-7142.

Sincerely yours,

Mac A. Weaver, P.E.
Chief
UIC State Programs

Chemical Group
Hoechst Celanese Corporation
Bay City Plant
PO Box 509
Highway 3057
Bay City, TX 77404-0509

December 7, 1993
IOC-097-93

CERTIFIED MAIL

Mr. Ben Knape, Head
Underground Injection Control Unit
Texas Natural Resource Conservation Commission
P. O. Box 13087
1700 North Congress Avenue
Austin, TX 78711-3087

SUBJECT: WDW-110 & WDW-14
5-YEAR MIT/FALLOFF TEST SCHEDULE
HOECHST CELANESE CHEMICAL GROUP, INC.
BAY CITY PLANT, BAY CITY, TEXAS

Dear Mr. Knape:


For your review and approval, please find attached the schedule and proposed procedures for the 5-year mechanical integrity testing and annual bottom hole pressure falloff test on WDW-14 and WDW-110.

Your consideration of our request is appreciated.

Please review and comment on the attached procedures as soon as possible.

If you have any questions, contact me at (409) 241-4197.

Respectfully,


I. O. Coleman, Jr.
Environmental Section Leader

IOC/cjs
attachment

cc:

Mr. Larry Walker, Geologist
UIC Team
UIC, Uranium and Radioactive Waste Section
Industrial and Hazardous Waste Division
Texas Natural Resource Conservation Commission
P. O. Box 13087
1700 North Congress Avenue
Austin, TX 78711-3087

Mr. Chuck Green
Texas Natural Resource Conservation Commission
P. O. Box 13087
Austin, TX 78711-3087

Mr. Phil Dellinger, USEPA Region VI
Environmental Protection Agency, Region VI
Emergency Response Branch (6E-E)
1445 Ross Ave.
Dallas, Tx 75202-2733

Mr. Tom Jones, ECO
ECO Solutions
10333 Richmond Avenue
Suite 250
Houston, TX 77042



Mr. Bob Hall, ECO
ECO Solutions
10333 Richmond Avenue
Suite 250
Houston, TX 77042

*MECHANICAL INTEGRITY/FALLOFF TESTING SCHEDULE
WDW NOS. 14 & 110*

*HOECHST CELANESE - CHEMICAL GROUP
BAY CITY, TEXAS*

Prepared by ECO Solutions Inc.

Two key assumptions were made in the preparation of the following 5-year mechanical integrity test schedule. The schedule assumes that 1) WDW-49 will remain brined in and that 2) WDW-14 can be either shut-in or in non-hazardous service during the aldehyde unit shut down. The aldehyde unit shutdown will extend from February 11, 1994 thru February 28, 1994.

Friday, February 11, 1994

WDW-14 shall be placed in non-hazardous service. Flowrates should be maintained at maximum constant operating conditions or as well conditions allow. WDW-14 is to be shut-in for falloff testing on February 15, 1993.

WDW-32 and WDW-110 flowrates should be held constant to minimize flow/pressure transients in the reservoir prior to testing WDW-14. WDW-32 will be taken out of service on February 13, 1993.

Saturday, February 12, 1994

WDW-14 should be held at maximum constant operating conditions until the bottom hole pressure falloff test on February 15th.

WDW-32 and WDW-110 flowrates should be held constant to minimize flow/pressure transients in the reservoir prior to testing WDW-14. WDW-32 and WDW-110 will be taken out of service on February 13, 1993.

Sunday, February 13, 1994

WDW-14 should be held at maximum constant operating conditions until the bottom hole pressure falloff test on February 15th.

WDW-32 and WDW-110 should be taken out of service at 7:00 A.M.. WDW-32 will remain out of service until the completion of testing on February 25th. WDW-110 will remain out of service until February 18th.

Monday, February 14, 1994

WDW-14 should be held at maximum constant operating conditions until the bottom hole pressure falloff test on February 15th.

WDW-32 will remain out of service until the completion of testing on February 24th. WDW-110 will remain out of service until February 18th.

Tuesday, February 15, 1994

WDW-14, move in and rig up logging unit. Run surface readout bottom hole pressure gauges into WDW-14. Maintain constant flowrates into well while the bottom hole pressure gauges record bottom hole flowing pressures for several hours. Shut well in.

WDW-14 will remain out of service until the completion of testing on WDW-110 on February 24th. However, HCCG's neutral effluent and injection pumps will be required for the radioactive tracer survey scheduled for February 18th

WDW-32 will remain out of service until the completion of testing on February 24th. WDW-110 will remain out of service until February 18th.

Wednesday, February 16, 1994

WDW-14, monitor bottom hole pressure falloff with surface readout bottom hole pressure gauges and allow well to thermally stabilize.

WDW-32 will remain out of service until the completion of testing on February 24th. WDW-110 will remain out of service until February 18th.

Thursday, February 17, 1994

WDW-14, monitor bottom hole pressure falloff with surface readout bottom hole pressure gauges and allow well to thermally stabilize.

WDW-32 will remain out of service until the completion of testing on February 24th. WDW-110 will remain out of service until February 18th.

Chemical Group

Hoechst Celanese Corporation
Bay City Plant
PO Box 509
Highway 3057
Bay City, TX 77404-0509

December 7, 1993
IOC-096-93

FEDERAL EXPRESS MAIL

Mr. Ben Knape, Head
Underground Injection Control Unit
Texas Natural Resource Conservation Commission
P. O. Box 13087
1700 North Congress Avenue
Austin, Texas 78711-3087

SUBJECT: WDW-49 (PLANT WASTE DISPOSAL WELL #4)
STATUS UPDATE
HOECHST CELANESE CHEMICAL GROUP, INC.
BAY CITY PLANT, BAY CITY, TEXAS

Dear Mr. Knape:

This letter outlines the Bay City Plant's strategy and schedule in addressing the annulus pressure-test failure of WDW-49. Also included with this transmittal are the well repair/5-year mechanical test procedures for your review and approval. Currently the well is not in service and filled with brine. No changes in this status are anticipated at this time.

We propose that the attached repair procedures or another alternate plan be implemented within the next 24 months. The extended schedule will allow us maximum flexibility in addressing future plant disposal requirements.

We will be considering various options over the next 24 months to determine the ultimate disposition of the well. Several options that will be considered are:

1. Conduct the 5-year mechanical integrity test and install new injection string (see attached procedures, Addendum I).
2. Recomplete WDW-49 in the existing formation.
3. Potentially deepen the well to the lower Miocene for the disposal of acidic waste.
4. Plug and abandon WDW-49.

Hoechst

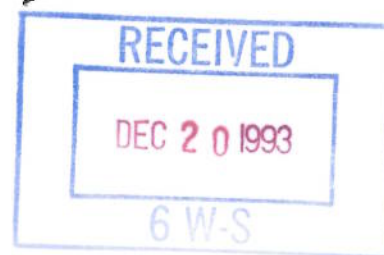
12/7/93

Mr. Larry Walker, Geologist
UIC Team
UIC, uranium and Radioactive Waste Section
Industrial and Hazardous Waste Division
Texas Natural Resource Conservation Commission
P. O. Box 13087
1700 North Congress Avenue
Austin, TX 78711-3087

Mr. Chuck Green,
Texas Natural Resource Conservation Commission
P. O. Box 13087
Austin, TX 78711-3087

Mr. Phil Dellinger, USEPA Region VI
Environmental Protection Agency, Region VI
Emergency Response Branch (6E-E)
1445 Ross Ave.
Dallas, Tx 75202-2733

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ECO Solutions
10333 Richmond Avenue
Suite 250
Houston, TX 77042



Mr. Bob Hall, ECO
ECO Solutions
10333 Richmond Avenue
Suite 250
Houston, TX 77042



Hoechst Celanese

(4)

Chemical Group
Hoechst Celanese Corporation
Bay City Plant
PO Box 509
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May 9, 1994
IOC-043-94

FEDERAL EXPRESS MAIL - 8635790590

Mr. Ben K. Knape - Head
UIC Team
UIC, Uranium and Radioactive Waste Section
Industrial and Hazardous Waste Division
Texas Natural Resource Conservation Commission
P. O. Box 13087
1700 North Congress Avenue
Austin, Texas 78711-3087

Subject: WDW-49 (PLANT WELL NUMBER 4)
WORKOVER AND MECHANICAL INTEGRITY TESTING REPORT
HOECHST CELANESE CHEMICAL GROUP, INC.
BAY CITY PLANT, BAY CITY, TEXAS

Dear Mr. Knape:

Two copies of the Workover and Mechanical Intergity Testing report on WDW-49 are enclosed. These reports are provided for your review and approval. As you are aware, the workover and mechanical integrity testing were performed between March 3rd and March 18, 1994 by our Contractor, ECO Solutions, Inc.

Please contact me at 409/241-4197 or Mr. Ray Horton at 409/241-4076 if you have comments or questions about the report.

Very truly yours,

I. O. Coleman, Jr.
I. O. Coleman, Jr.

cc: Mr. Laurence G. Walker - w/o report
UIC Team
Industrial and Hazardous Waste Division
Texas Natural Resource Conservation Commission
P. O. Box 13087
Austin, Texas 78711-3087

Mr. Phil Dellinger (CERTIFIED MAIL) - w/ report
Underground Injection Control Program
Environmental Protection Agency
1445 Ross Avenue, Suite #1200
Dallas, Texas 75202-2733

Hoechst 

April 27, 1994
IOC-038-94

Chemical Group
Hoechst Celanese Corporation
Bay City Plant
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Bay City, TX 77404-0509

CERTIFIED MAIL

Mr. Ben K. Knape - Head
UIC Team
UIC, Uranium and Radioactive Waste Section
Industrial and Hazardous Waste Division
Texas Natural Resource Conservation Commission
P. O. Box 13087
1700 North Congress Avenue
Austin, Texas 78711-3087

Subject: PRESSURE FALLOFF MECHANICAL INTEGRITY TESTING
(MIT) REPORT FOR WDW-110

Dear Mr. Knape:

Enclosed are two copies of the Pressure Falloff and MIT report for WDW-110 which are provided for your review and approval. As you are aware, the testing occurred between February 21st and March 28th, 1994 and was performed by our Contractor, ECO Solutions, Inc., Houston, Texas.

Please don't hesitate to contact me at 409/241-4197 if you have comments and/or questions concerning the report.

Very truly yours,

I. O. Coleman, Jr. /cjs
I. O. Coleman, Jr.
Environmental Section Leader

IOC/cjs
attachment

cc: Mr. Laurence G. Walker, Geologist
UIC Team
Industrial and Hazardous Waste Division
Texas Natural Resource Conservation Commission
P. O. Box 13087
Austin, Texas 78711-3087

Mr. Phil Dellinger - **CERTIFIED MAIL** - w/report
Underground Injection Control Program
Environmental Protection Agency
1445 Ross Avenue, Suite #1200
Dallas, Texas 75202-2733

Chemical Group
Hoechst Celanese Corporation
Bay City Plant
PO Box 509
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Bay City, TX 77404-0509

April 26, 1994
IOC-037-94

CERTIFIED MAIL

Mr. Ben K. Knape - Head
UIC Team
UIC, Uranium and Radioactive Waste Section
Industrial and Hazardous Waste Division
Texas Natural Resource Conservation Commission
P. O. Box 13087
1700 North Congress Avenue
Austin, Texas 78711-3087

Subject: **PRESSURE FALLOFF MECHANICAL INTEGRITY TESTING
(MIT) AND FALLOFF REPORT FOR WDW-14**

Dear Mr. Knape:

Enclosed are two copies of the Pressure Falloff and MIT report for WDW-14 which are provided for your review and approval. As you are aware, the testing occurred between February 16th and February 22nd, 1994 and was performed by our Contractor, ECO Solutions, Inc., Houston, Texas.

Please don't hesitate to contact me at 409/241-4197 if you have comments and/or questions concerning the report.

Very truly yours,

I. O. Coleman, Jr. / cjs

I. O. Coleman, Jr.
Environmental Section Leader

IOC/cjs
attachment

cc: Mr. Laurence G. Walker, Geologist
UIC Team
Industrial and Hazardous Waste Division
Texas Natural Resource Conservation Commission
P. O. Box 13087
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Mr. Phil Dellinger - **CERTIFIED MAIL** - w/report
Underground Injection Control Program
Environmental Protection Agency
1445 Ross Avenue, Suite #1200
Dallas, Texas 75202-2733

4
4/12/94
APR 14 1994

CERTIFIED MAIL Z 013 011 515 RETURN RECEIPT REQUESTED

Mr. I. O. Coleman, Jr.
Hoechst Celanese Corporation
Bay City Plant
P. O. Box 509
Highway 3057
Bay City, Texas 77404-0509

Dear Mr. Coleman:

We have completed the review of the pressure falloff test conducted in November 1993 for well WDW-32. Based on this review, the EPA has determined that Hoechst Celanese Corporation has fulfilled Petition Approval Condition No. 8 for the year May 4, 1993, to May 4, 1994.

If you have any questions or comments please contact Joe Kordzi at (214) 655-7186 or Phil Dellinger at (214) 655-7142.

Sincerely yours,

Mac A. Weaver, P.E.
Chief
UIC State Programs Section (6W-SU)

cc: Ben Knape, TNRCC

6W-SU:4/7/94:HOWARD:H:\LBAN\WP50\CELANESE\CELANESE.BA\FLOFFAPR.93
6W-SU 6W-SU 6W-SU
KORDZI DELLINGER WEAVER

4/7/94
J.K.

4/11/94
W.C.

fib (4)

R E C O R D O F C O M M U N I C A T I O N

TO: Celanese Bay City File

FROM: Phil Dellinger

DATE: February 23, 1994

TYPE OF COMM: Phone Call

SUBJECT: Mechanical Integrity Test for WDW-14

SUMMARY: Tom Jones of Eco Solutions, Inc. called to report that the mechanical integrity testing on Celanese Bay City Well WDW-14 indicated a hole in the casing below the packer and the well had been shut in. I told him to send the testing info to us soon.

CONCLUSION, ACTION TAKEN OR REFERRED:

FILE COPIES TO:

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Chemical Group

Hoechst Celanese Corporation
Bay City Plant
PO Box 509
Highway 3057
Bay City, TX 77404-0509

February 2, 1994
IOC-013-94

CERTIFIED MAIL

Mr. Mac A. Weaver, P. E., Chief
UIC State Programs Section (6W-SU)
United States Environmental Protection Agency
Region 6
1445 Ross Avenue, Suite 1200
Dallas, Texas 75202-2733

Subject: Response To NOD Letter Dated January 12, 1994
Class I Injection Well Permit, No. WDW-32
Hoechst Celanese Chemical Group, Inc.,
Bay City Plant, Bay City, Texas
(Attachment I, NOD Letter Dated 1/12/94 Enclosed
For Your Quick Reference)

Dear Mr. Weaver:

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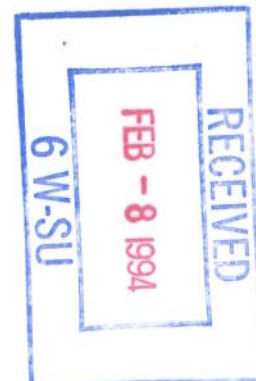
I. O. Coleman, Jr.

IOC/cjs
attachment



cc: Mr. Joe Kordzi
UIC State Programs Section (6W-SU)
U. S. Environmental Protection Agency
1445 Ross Avenue, Suite 1200
Dallas, Texas 75202-2733

Mr. Ben Knape, Chief
UIC Section
Texas Natural Resource Conservation Commission
P. O. Box 13087, Capitol Station
Austin, Texas 78711-3087





UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION 6
1445 ROSS AVENUE, SUITE 1200
DALLAS, TX 75202-2733

January 12, 1994

CERTIFIED MAIL P 873 011 248 RETURN RECEIPT REQUESTED

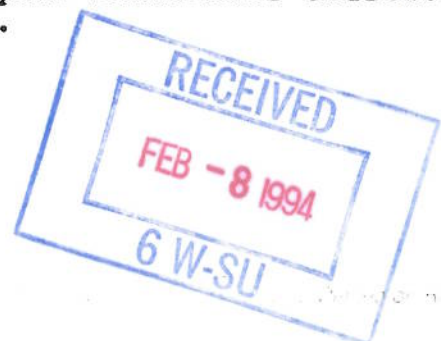
Mr. I. O. Coleman, Jr.
Hoechst Celanese Corporation
Bay City Plant
P. O. Box 509
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Bay City, Texas 77404-0509

Dear Mr. Coleman:

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3. Worked through calculations, with appropriate explanative text for t_p , the injection period; the time to exit the waste front; the flowing bottomhole pressure; and radius of investigation.
4. A comparison of the static and flowing bottomhole pressures with those predicted by the petition.

In general your report lacks any explanative text and is merely a summary of the data and well analysis. This type of presentation makes it extremely difficult to review your well test. In addition, many of the above comments are covered in the "Pressure Falloff Testing Guideline, First Revision", which was sent to you several months ago. Please ensure that your contractor follows this document in conducting future tests.

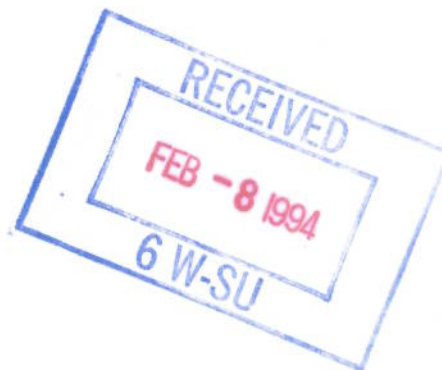


If you have any questions, please contact Joe Kordzi at (214) 655-7186 or Phil Dellinger at (214) 655-7142.

Sincerely yours,



Mac A. Weaver, P.E.
Chief
UIC State Programs



4
JAN 12 1994

CERTIFIED MAIL P 873 011 248 RETURN RECEIPT REQUESTED

Mr. I. O. Coleman, Jr.
Hoechst Celanese Corporation
Bay City Plant
P. O. Box 509
Highway 3057
Bay City, Texas 77404-0509

Dear Mr. Coleman:

Your 1993 annual report for WDW-32 has been reviewed. Please provide the following by February 10, 1994:

1. A detailed summary of events in real time. This should include information on the following: the length of the injection period prior to falloff, rate changes including any that occurred during running of the gauges, problems encountered, etc.
2. A discussion of how the falloff testing was analyzed, including what software was employed, the type of simulation that was performed, assumptions, etc.
3. Worked through calculations, with appropriate explanative text for t_p , the injection period; the time to exit the waste front; the flowing bottomhole pressure; and radius of investigation.
4. A comparison of the static and flowing bottomhole pressures with those predicted by the petition.

In general your report lacks any explanative text and is merely a summary of the data and well analysis. This type of presentation makes it extremely difficult to review your well test. In addition, many of the above comments are covered in the "Pressure Falloff Testing Guideline, First Revision", which was sent to you several months ago. Please ensure that your contractor follows this document in conducting future tests.

S. K. 1/11/94
6W-SU:1/10/94:KORDZI:MH:H:\LBAN\WP50\CELANESE\CELANESE.BA\
CELBAY93.ANL

6W-SU 6W-SU
DELLINGER WEAVER

PD 1/11/94 mw 1/11/94

If you have any questions, please contact Joe Kordzi at (214) 655-7186 or Phil Dellinger at (214) 655-7142.

Sincerely yours,

Mac A. Weaver, P.E.
Chief
UIC State Programs

Chemical Group

Hoechst Celanese Corporation
Bay City Plant
PO Box 509
Highway 3057
Bay City, TX 77404-0509

December 7, 1993
IOC-097-93

CERTIFIED MAIL

Mr. Ben Knape, Head
Underground Injection Control Unit
Texas Natural Resource Conservation Commission
P. O. Box 13087
1700 North Congress Avenue
Austin, TX 78711-3087

SUBJECT: WDW-110 & WDW-14
5-YEAR MIT/FALLOFF TEST SCHEDULE
HOECHST CELANESE CHEMICAL GROUP, INC.
BAY CITY PLANT, BAY CITY, TEXAS

Dear Mr. Knape:

For your review and approval, please find attached the schedule and proposed procedures for the 5-year mechanical integrity testing and annual bottom hole pressure falloff test on WDW-14 and WDW-110.

Your consideration of our request is appreciated.

Please review and comment on the attached procedures as soon as possible.

If you have any questions, contact me at (409) 241-4197.

Respectfully,


I. O. Coleman, Jr.
Environmental Section Leader

IOC/cjs
attachment

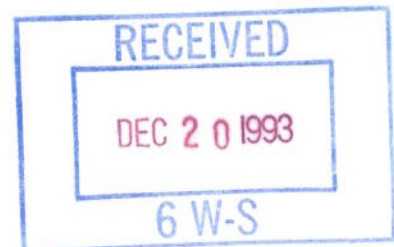
cc:

Mr. Larry Walker, Geologist
UIC Team
UIC, Uranium and Radioactive Waste Section
Industrial and Hazardous Waste Division
Texas Natural Resource Conservation Commission
P. O. Box 13087
1700 North Congress Avenue
Austin, TX 78711-3087

Mr. Chuck Green
Texas Natural Resource Conservation Commission
P. O. Box 13087
Austin, TX 78711-3087

Mr. Phil Dellinger, USEPA Region VI
Environmental Protection Agency, Region VI
Emergency Response Branch (6E-E)
1445 Ross Ave.
Dallas, Tx 75202-2733

Mr. Tom Jones, ECO
ECO Solutions
10333 Richmond Avenue
Suite 250
Houston, TX 77042



Mr. Bob Hall, ECO
ECO Solutions
10333 Richmond Avenue
Suite 250
Houston, TX 77042

*MECHANICAL INTEGRITY/FALLOFF TESTING SCHEDULE
WDW NOS. 14 & 110*

*HOECHST CELANESE - CHEMICAL GROUP
BAY CITY, TEXAS*

Prepared by ECO Solutions Inc.

Two key assumptions were made in the preparation of the following 5-year mechanical integrity test schedule. The schedule assumes that 1) WDW-49 will remain brined in and that 2) WDW-14 can be either shut-in or in non-hazardous service during the aldehyde unit shut down. The aldehyde unit shutdown will extend from February 11, 1994 thru February 28, 1994.

Friday, February 11, 1994

WDW-14 shall be placed in non-hazardous service. Flowrates should be maintained at maximum constant operating conditions or as well conditions allow. WDW-14 is to be shut-in for falloff testing on February 15, 1993.

WDW-32 and WDW-110 flowrates should be held constant to minimize flow/pressure transients in the reservoir prior to testing WDW-14. WDW-32 will be taken out of service on February 13, 1993.

Saturday, February 12, 1994

WDW-14 should be held at maximum constant operating conditions until the bottom hole pressure falloff test on February 15th.

WDW-32 and WDW-110 flowrates should be held constant to minimize flow/pressure transients in the reservoir prior to testing WDW-14. WDW-32 and WDW-110 will be taken out of service on February 13, 1993.

Sunday, February 13, 1994

WDW-14 should be held at maximum constant operating conditions until the bottom hole pressure falloff test on February 15th.

WDW-32 and WDW-110 should be taken out of service at 7:00 A.M.. WDW-32 will remain out of service until the completion of testing on February 25th. WDW-110 will remain out of service until February 18th.

Monday, February 14, 1994

WDW-14 should be held at maximum constant operating conditions until the bottom hole pressure falloff test on February 15th.

WDW-32 will remain out of service until the completion of testing on February 24th. WDW-110 will remain out of service until February 18th.

Tuesday, February 15, 1994

WDW-14, move in and rig up logging unit. Run surface readout bottom hole pressure gauges into WDW-14. Maintain constant flowrates into well while the bottom hole pressure gauges record bottom hole flowing pressures for several hours. Shut well in.

WDW-14 will remain out of service until the completion of testing on WDW-110 on February 24th. However, HCCG's neutral effluent and injection pumps will be required for the radioactive tracer survey scheduled for February 18th

WDW-32 will remain out of service until the completion of testing on February 24th. WDW-110 will remain out of service until February 18th.

Wednesday, February 16, 1994

WDW-14, monitor bottom hole pressure falloff with surface readout bottom hole pressure gauges and allow well to thermally stabilize.

WDW-32 will remain out of service until the completion of testing on February 24th. WDW-110 will remain out of service until February 18th.

Thursday, February 17, 1994

WDW-14, monitor bottom hole pressure falloff with surface readout bottom hole pressure gauges and allow well to thermally stabilize.

WDW-32 will remain out of service until the completion of testing on February 24th. WDW-110 will remain out of service until February 18th.

Friday, February 18, 1994

WDW-14, conduct annulus pressure test, temperature survey and radioactive tracer survey. HCCG's neutral effluent and injection pumps will be required for the radioactive tracer survey. Rig down and release logging equipment. WDW-14 will remain out of service until the completion of testing on WDW-110 on February 24th.

WDW-110, conduct annulus pressure test, temperature survey and radioactive tracer survey. HCCG's neutral effluent and injection pumps will be required for the radioactive tracer survey. Rig down and release logging equipment. Place well back in service.

WDW-32, out of service until the completion of testing on February 24th.

Saturday, February 19, 1994

WDW-110 should be held at maximum constant operating conditions, or as plant constraints allow, until the bottom hole pressure falloff test on February 22nd.

WDW-14 and WDW-32 shall remain out of service until February 24th.

Sunday, February 20, 1994

WDW-110 should be held at maximum constant operating conditions, or as plant constraints allow, until the bottom hole pressure falloff test on February 22nd.

WDW-14 and WDW-32 shall remain out of service until February 24th.

Monday, February 21, 1994

WDW-110 should be held at maximum constant operating conditions, or as plant constraints allow, until the bottom hole pressure falloff test on February 22nd.

WDW-14 and WDW-32 shall remain out of service until February 24th.

Tuesday, February 22, 1994

WDW-110, move in and rig up logging unit. Run surface readout bottom hole pressure gauges into WDW-110. Maintain constant flowrates into well while the bottom hole pressure gauges record bottom hole flowing pressures for several hours. Shut well in and monitor bottom hole pressure.

Friday, February 18, 1994

WDW-14, conduct an tracer survey. HCCG's the radioactive tracer su 14 will remain out of s February 24th.

WDW-110, conduct an tracer survey. HCCG's the radioactive tracer su well back in service.

WDW-32, out of service

Saturday, February 19, 1994

WDW-110 should be he constraints allow, until t

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Sunday, February 20, 1994

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Monday, February 14, 1994

WDW-14 should be held at maximum constant operating conditions until the bottom hole pressure falloff test on February 15th.

WDW-32 will remain out of service until the completion of testing on February 24th. WDW-110 will remain out of service until February 18th.

Tuesday, February 15, 1994

WDW-14, move in and rig up logging unit. Run surface readout bottom hole pressure gauges into WDW-14. Maintain constant flowrates into well while the bottom hole pressure gauges record bottom hole flowing pressures for several hours. Shut well in.

WDW-14 will remain out of service until the completion of testing on WDW-110 on February 24th. However, HCCG's neutral effluent and injection pumps will be required for the radioactive tracer survey scheduled for February 18th

WDW-32 will remain out of service until the completion of testing on February 24th. WDW-110 will remain out of service until February 18th.

Wednesday, February 16, 1994

WDW-14, monitor bottom hole pressure falloff with surface readout bottom hole pressure gauges and allow well to thermally stabilize.

WDW-32 will remain out of service until the completion of testing on February 24th. WDW-110 will remain out of service until February 18th.

Thursday, February 17, 1994

WDW-14, monitor bottom hole pressure falloff with surface readout bottom hole pressure gauges and allow well to thermally stabilize.

WDW-32 will remain out of service until the completion of testing on February 24th. WDW-110 will remain out of service until February 18th.

*MECHANICAL INTEGRITY/FALLOFF TESTING SCHEDULE
WDW NOS. 14 & 110*

*HOECHST CELANESE - CHEMICAL GROUP
BAY CITY, TEXAS*

Prepared by ECO Solutions Inc.

Two key assumptions were made in the preparation of the following 5-year mechanical integrity test schedule. The schedule assumes that 1) WDW-49 will remain brined in and that 2) WDW-14 can be either shut-in or in non-hazardous service during the aldehyde unit shut down. The aldehyde unit shutdown will extend from February 11, 1994 thru February 28, 1994.

Friday, February 11, 1994

WDW-14 shall be placed in non-hazardous service. Flowrates should be maintained at maximum constant operating conditions or as well conditions allow. WDW-14 is to be shut-in for falloff testing on February 15, 1993.

WDW-32 and WDW-110 flowrates should be held constant to minimize flow/pressure transients in the reservoir prior to testing WDW-14. WDW-32 will be taken out of service on February 13, 1993.

Saturday, February 12, 1994

WDW-14 should be held at maximum constant operating conditions until the bottom hole pressure falloff test on February 15th.

WDW-32 and WDW-110 flowrates should be held constant to minimize flow/pressure transients in the reservoir prior to testing WDW-14. WDW-32 and WDW-110 will be taken out of service on February 13, 1993.

Sunday, February 13, 1994

WDW-14 should be held at maximum constant operating conditions until the bottom hole pressure falloff test on February 15th.

Friday, February 18, 1994

WDW-14, conduct annulus pressure test, temperature survey and radioactive tracer survey. HCCG's neutral effluent and injection pumps will be required for the radioactive tracer survey. Rig down and release logging equipment. WDW-14 will remain out of service until the completion of testing on WDW-110 on February 24th.

WDW-110, conduct annulus pressure test, temperature survey and radioactive tracer survey. HCCG's neutral effluent and injection pumps will be required for the radioactive tracer survey. Rig down and release logging equipment. Place well back in service.

WDW-32, out of service until the completion of testing on February 24th.

Saturday, February 19, 1994

WDW-110 should be held at maximum constant operating conditions, or as plant constraints allow, until the bottom hole pressure falloff test on February 22nd.

WDW-14 and WDW-32 shall remain out of service until February 24th.

Sunday, February 20, 1994

WDW-110 should be held at maximum constant operating conditions, or as plant constraints allow, until the bottom hole pressure falloff test on February 22nd.

WDW-14 and WDW-32 shall remain out of service until February 24th.

Monday, February 21, 1994

WDW-110 should be held at maximum constant operating conditions, or as plant constraints allow, until the bottom hole pressure falloff test on February 22nd.

WDW-14 and WDW-32 shall remain out of service until February 24th.

Tuesday, February 22, 1994

WDW-110, move in and rig up logging unit. Run surface readout bottom hole pressure gauges into WDW-110. Maintain constant flowrates into well while the bottom hole pressure gauges record bottom hole flowing pressures for several hours. Shut well in and monitor bottom hole pressure.

WDW-14 and WDW-32 shall remain out of service until February 24th.

Wednesday, February 23, 1994

WDW-110, continue monitoring bottom hole pressure falloff with surface readout bottom hole pressure gauges.

WDW-14 and WDW-32 will remain out of service until February 24th.

Thursday, February 24, 1994

WDW-110, pull out of the hole with surface readout bottom hole pressure gauges. Rig down and release logging unit. Place well back in service.

WDW-32, place well back in service at the completion of testing on WDW-110.

WDW-14, place well back in service at the completion of testing on WDW-110.

FIELD OPERATIONS COMPLETE

Chemical Group

Hoechst Celanese Corporation
Bay City Plant
PO Box 509
Highway 3057
Bay City, TX 77404-0509

December 7, 1993
IOC-096-93

FEDERAL EXPRESS MAIL

Mr. Ben Knappe, Head
Underground Injection Control Unit
Texas Natural Resource Conservation Commission
P. O. Box 13087
1700 North Congress Avenue
Austin, Texas 78711-3087

SUBJECT: WDW-49 (PLANT WASTE DISPOSAL WELL #4)
STATUS UPDATE
HOECHST CELANESE CHEMICAL GROUP, INC.
BAY CITY PLANT, BAY CITY, TEXAS

Dear Mr. Knappe:

This letter outlines the Bay City Plant's strategy and schedule in addressing the annulus pressure-test failure of WDW-49. Also included with this transmittal are the well repair/5-year mechanical test procedures for your review and approval. Currently the well is not in service and filled with brine. No changes in this status are anticipated at this time.

We propose that the attached repair procedures or another alternate plan be implemented within the next 24 months. The extended schedule will allow us maximum flexibility in addressing future plant disposal requirements.

We will be considering various options over the next 24 months to determine the ultimate disposition of the well. Several options that will be considered are:

1. Conduct the 5-year mechanical integrity test and install new injection string (see attached procedures, Addendum I).
2. Recomplete WDW-49 in the existing formation.
3. Potentially deepen the well to the lower Miocene for the disposal of acidic waste.
4. Plug and abandon WDW-49.

12/7/93

The attached temperature log was conducted on October 29, 1993 as part of the mechanical integrity testing program (prior to the annulus pressure test). The log provides evidence that WDW-49 has mechanical integrity with the exception of a small leak in a threaded connection in the injection tubing at 3,020'. The temperature log also indicates that:

- ♠ No interformational transfer of fluids is occurring between aquifers above the injection zone.
- ♠ All fluids being injected are being confined to the injection interval.
- ♠ The presence of a tubing leak in a threaded connection at 3,020'.

If you have any questions, please contact me at (409) 241-4197.

Respectfully,



Mr. I. O. Coleman, Jr.
Environmental Section Leader

IOC/cjs
attachments

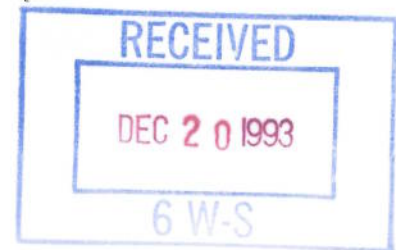
12/7/93

Mr. Larry Walker, Geologist
UIC Team
UIC, uranium and Radioactive Waste Section
Industrial and Hazardous Waste Division
Texas Natural Resource Conservation Commission
P. O. Box 13087
1700 North Congress Avenue
Austin, TX 78711-3087

Mr. Chuck Green,
Texas Natural Resource Conservation Commission
P. O. Box 13087
Austin, TX 78711-3087

Mr. Phil Dellinger, USEPA Region VI
Environmental Protection Agency, Region VI
Emergency Response Branch (6E-E)
1445 Ross Ave.
Dallas, Tx 75202-2733

Mr. Tom Jones, ECO
ECO Solutions
10333 Richmond Avenue
Suite 250
Houston, TX 77042



Mr. Bob Hall, ECO
ECO Solutions
10333 Richmond Avenue
Suite 250
Houston, TX 77042

ADDENDUM I

REPAIR PROCEDURES HOECHST CELANESE BAY CITY PLANT WELL NUMBER 4

The following plan was developed by Eco Solutions, Inc., to repair the leak in the injection tubing and satisfy five-year Mechanical Integrity Test requirements on Hoechst Celanese number 4 (WDW-49) injection well at Bay City, Texas. Please note that a temperature log was conducted on October 29, 1993.

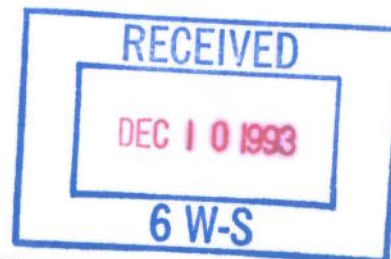
1. Obtain approval from Texas Natural Resource Conservation Commission
2. Move in an rig up workover rig.
3. Disassemble wellhead and nipple up blowout preventor.
4. Release 5½" injection tubing from packer and pull out of the hole with same.
5. Run electromagnetic casing inspection log from packer depth back to surface.
6. Go in the hole with test seal assembly on workstring and engage packer.
7. Pressure test annulus to 1,000 psig from 30 minutes.
8. Pull out of the hole with test seal assembly - lay down workstring.
9. Go in the hole with redressed seal assembly on new 5½" 20#/ft. N-80 LT&C injection string.
10. Displace annulus with corrosion inhibited brine.
11. Engage packer, nipple down blowout preventor and reassemble wellhead.
12. Pressure test annulus to 1000 psig for 30 minutes.
13. Rig down workover rig.
14. Conduct annulus pressure test and radioactive tracer survey for mechanical integrity test.
15. Place well in non-hazardous service for one week.
16. Perform bottom hole pressure falloff test with non-hazardous effluent.

Chemical Group
Hoechst Celanese Corporation
Bay City Plant
PO Box 509
Highway 3057
Bay City, TX 77404-0509

December 6, 1993
IOC-095-93

CERTIFIED MAIL

Mr. Laurence G. Walker, Geologist
UIC Team
UIC, Uranium and Radioactive Waste Section
Industrial and Hazardous Waste Division
Texas Natural Resource Conservation Commission
P. O. Box 13087
1700 North Congress Avenue
Austin, Texas 78711-3087



Subject: **MECHANICAL INTEGRITY TEST (MIT) REPORT FOR WDW-32**

Dear Mr. Walker:

Enclosed are two copies of the MIT report for WDW-32 which are provided for your review and approval. As you are aware the testing occurred between October 25th and October 28th 1993 and was performed by our contractor, ECO Solutions, Inc., Houston, Texas.

Please don't hesitate to contact me at 409/241-4197 if you have comments and/or questions concerning the report.

Very truly yours,

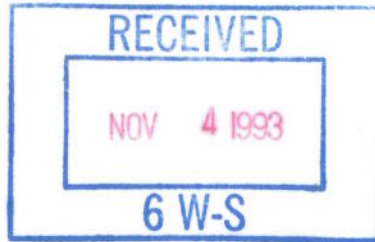
I. O. Coleman, Jr. /cjs

I. O. Coleman, Jr.
Environmental Section Leader

IOC/cjs
attachment

cc: Mr. Ben K. Knape, Head - w/o
UIC Team
Industrial and Hazardous Waste Division
Texas Natural Resource Conservation Commission
P. O. Box 13087
Austin, Texas 78711-3087

Mr. Phil Dellinger - **CERTIFIED MAIL** - w/report
Underground Injection Control Program
Environmental Protection Agency
1445 Ross Avenue, Suite #1200
Dallas, Texas 75202-2733



Chemical Group
Hoechst Celanese Corporation
Bay City Plant
PO Box 509
Highway 3057
Bay City, TX 77404-0509

November 3, 1993
IOC-088-93

FEDERAL EXPRESS

Mr. Ben Knape, Head
Underground Injection Control Unit
Texas Natural Resource Conservation Commission (TNRCC)
P. O. Box 13087
1700 North Congress Avenue
Austin, Texas 78711-3087
And
Park 35 Circle Colonnade Building
12015 North IH 35
Austin, Texas 78723

Subject: WDW-49
Mechanical Integrity Testing (MIT) Update
Hoechst Celanese Chemical Group, Inc.
Bay City Plant, Bay City, Texas

Dear Mr. Knape:

On Friday, October 29, 1993, the annual scheduled MIT was performed on WDW-49. During the annulus pressure test, the annulus was pressurized to 1100 psi and a pressure decline of 3 to 7 psi per minute was observed.

This letter documents the failure of WDW-49 of the annular pressure test. As you are aware, the testing was witnessed by Mr. Larry Walker of your Austin, Texas Office.

WDW-49 was filled with brine and shut-in prior to the MIT and will remain shut-in until a strategy is generated and implemented to address the failure. Just prior to the annulus pressure test, a temperature log was performed and indicates that the probable cause of the failure is a tubing leak associated with a connection at a depth of 3020 feet.

A workover plan and a tentative schedule will be prepared and submitted to you (within 30 working days) on or before December 13, 1993.

Please contact me at 409/241-4197 if any additional information is needed.

Very truly yours,

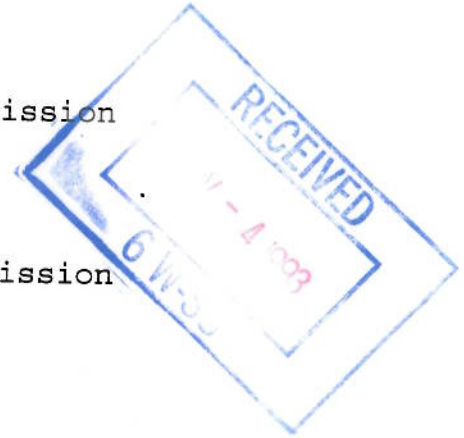

I. S. Coleman, Jr.

11/3/93

cc: Mr. Chuck Green
Texas Natural Resource Conservation Commission
P. O. Box 13087
Austin, Tx 78711-3087

Mr. Larry Walker
Texas Natural Resource Conservation Commission
P. O. Box 13087
Austin, TX 78711-3087

Mr. Phil Dellinger
UIC State Programs Section (6W-SU)
U.S. Environmental Protection Agency
Region 6
1445 Ross Avenue, Suite 1200
Dallas, TX 75202-2733



4

RECORD OF COMMUNICATION		<input checked="" type="checkbox"/> PHONE CALL <input type="checkbox"/> DISCUSSION <input type="checkbox"/> FIELD TRIP <input type="checkbox"/> CONFERENCE <input type="checkbox"/> OTHER (SPECIFY)	
TO: I. O. COLEMAN CELANESE BAY CITY		(Record of item checked above)	
		FROM: PHIL DELLINGER	DATE 11/1/93 TIME 9:30
SUBJECT ANNUAL WELL TEST FOR WDW 49-4			
SUMMARY OF COMMUNICATION			
<p>I. O. COLEMAN CALLED TO DISCUSS POSTPONING THE ANNUAL WELL TEST FOR WDW 49-4. THE WELL HAS A TUBING LEAK AND IS SHUT IN. A WORKOVER TO REMEDIATE THE PROBLEM HAS NOT BEEN COMPLETED.</p> <p>THE LAST WELL TEST RUN FOR WDW 49-4 WAS 9/22/92. I TOLD I. O. THAT RECORDED THE WELL TEST FOR WDW 49-4 SHOULD BE RUN AFTER THE WELL HAS BEEN RETURNED TO INTENTION.</p>			
CONCLUSIONS, ACTION TAKEN OR REQUIRED			
INFORMATION COPIES TO: CELANESE BAY CITY FILE			

(4)

September 21, 1993

Mr. I. O. Coleman
Hoechst Celanese Chemical Group, Inc.
P.O. Box 509
Bay City, Texas 77414

Dear Mr. Coleman:

Enclosed is the EPA Region 6 Pressure Falloff Testing Guideline - First Revision. This guideline should be followed in the performance of future falloff testing in fulfillment of the applicable petition condition outlined in your approved no migration petition exemption.

If you have any questions, please contact Joe Kordzi at (214) 655-7186.

Sincerely,

Mac A. Weaver, P.E.
Chief
UIC State Programs

Enclosure

6W-SU:9/20/93:HOWARD:H:\LBAN\WP50\CELANESE\CELANESE.BA\1REVGUID.R6
6W-SU 6W-SU 6W-SU
KORDZI DELLINGER WEAVER

J.K. 9/21/93

J.K. 9/21/93

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9/21/93

PRESSURE FALLOFF TESTING GUIDELINE

FIRST REVISION

REGION 6

September 14, 1993

BACKGROUND

The Hazardous and Solid Waste Amendments of 1984 to the Resource Conservation and Recovery Act mandated prohibitions on the land disposal of hazardous waste. These prohibitions are known as the land disposal restrictions and EPA promulgated regulations to implement these requirements for injection wells on July 26, 1988. The land disposal restrictions for injection wells are codified in 40 CFR Part 148. In addition to specifying the effective dates of the restrictions on injection of specific hazardous wastes, these regulations outline the requirements for obtaining an exemption to the restrictions.

Facilities which have received an exemption to the land disposal restrictions under 40 CFR Part 148 have demonstrated that, to a reasonable degree of certainty, there will be no migration of hazardous constituents from the injection zone for as long as the waste remains hazardous. As part of this approval, facilities are required by Region 6 to meet approval conditions including annual monitoring in accordance to 40 CFR 148.20(d)(2).

Region 6 has adopted the 40 CFR 146.68(e)(1) requirements for monitoring Class 1 hazardous waste disposal wells. Under 40 CFR 146.68(e)(1), operators are required to annually monitor the pressure buildup in the injection zone, including at a minimum, a shut down of the well for a time sufficient to conduct a valid observation of the pressure falloff curve.

PURPOSE OF GUIDELINE

This guideline has been developed by the Region 6 office of the EPA to assist operators in preparing an annual monitoring report. These reports, in most instances, should consist of a falloff test and a comparison of the reservoir parameters derived from the test with those of the petition demonstration. The primary function of this guideline is not to establish boundaries within which enforcement action can be taken. Rather, this guideline is intended to provide direction as to the correct performance of injection well falloff testing. Consequently, the annual report is viewed not as an enforcement tool, but as an annual reaffirmation that the petition demonstration continues to be valid. This constitutes the first revision of this guideline.

ANNUAL PRESSURE TESTING REQUIREMENTS

Basically, a falloff test consists of injecting at a constant rate, shutting in the well, and measuring the pressure falloff. The falloff test must be properly designed so that valid results are obtained. The following points should be kept in mind when planning or conducting a falloff test:

1. The injection rate should be held constant throughout the injection portion of the test. Small, normal fluctuations due to the design of the pump are acceptable. This rate should be at a high enough rate, for a period of time sufficient to produce a pressure buildup, which will result in a valid test. The amount of pressure buildup required will depend largely on the resolution of the pressure gauge used, and the specific properties of the formation. The injection rate must result in a pressure buildup such that a semilog straight line can be determined from the Horner plot.
2. Bottom hole pressure measurements are considered superior to surface pressure measurements. However, surface pressure measurements can be employed if it is demonstrated that a positive pressure is maintained at the surface throughout the falloff portion of the test. The surface pressure gauge must be located at the wellhead. For either surface or bottomhole pressure measurements, the well must be shut in at the wellhead in order to minimize wellbore storage and afterflow.
3. If surface pressure measurements will be employed and it is anticipated that the injection well will go on vacuum during the test, a two-rate test should be used in order to maintain a positive pressure. Failure to maintain a positive pressure would result in changing wellbore storage effects, making analysis of the test difficult. A relatively high initial rate should be followed by a decreased rate. The pressure decrease as a result of the rate decrease is then analyzed. Choosing the two rates correctly results in a positive surface pressure during the falloff portion of the test and the interpretation problem resulting from changing wellbore effects is thus eliminated.
4. The viscosity and density of the injected fluid should be held as constant as possible throughout the test. Operators are encouraged to use their normal waste streams as injectate, if enough volume will be available so that the guidelines in No. 1 above, concerning the injection rate, can be followed. The value of the viscosity employed in analyzing the test should be that of the fluid through which the pressure transients propagate. Note: This is not necessarily the viscosity of the injected fluid and may be the viscosity of the waste plume or the formation fluid, depending on the size of the waste plume. This is covered in more detail below.

5. Ideally, no injection in nearby facility wells should occur in the interval being tested. In addition, the pressure buildup in the injection interval due to offset wells should be stabilized prior to the shutin of the test well. Should operational problems prohibit this, the following steps should be taken:
 - a) The offset well should maintain as constant a rate as possible for several days prior to and throughout the test. The injection history of the offset injector just prior to shutin is the most influential to the falloff testing results.
 - b) The injection rate of the offset well should be recorded before and during the falloff period.
 - c) The falloff test should then be simulated, including the pressure influence due to the offset injection. The results of the simulation should then be compared to the observed falloff. Several commercially available software packages have this capability, or it can be done with simple in-house developed computer programs.

Following the above procedures does not, however, guarantee good results. Shutting in all injection in communicable zones nearby, and allowing the reservoir pressure to stabilize prior to falloff is strongly recommended. EPA has had success in assisting the coordination of cooperative well testing between nearby facilities.

6. The depth to any fill in the well tested should be tagged and recorded with the test. Operators are encouraged to conduct a flow profile survey in conjunction with the falloff testing in order to better define the thickness receiving flow.
7. The falloff portion of the injection well test should be run long enough such that enough data points lie well within the infinite acting period and the semilog straight line is well developed. Usually, if at least one log cycle of the semilog straight line is present, this will be satisfied.
8. A log-log plot with a semilog derivative should be supplied to enable identification of the end of the wellbore storage period. The beginning of the infinite acting portion of the test should be identified on both plots.
9. A Horner plot of the data should be submitted. In addition, the entire infinite acting portion of the Horner plot should be reproduced on an expanded scale in order to permit a closer inspection of any data fluctuations. The slope employed to calculate the kh/μ product should be drawn on both plots. In

addition, the beginning of the infinite acting portion of the test should be identified on both plots.

10. A photocopy of an SP or gamma ray log through the injection zone, with the completion perforations or screened areas annotated, should be submitted. The entire log is not necessary.
11. A cartesian graph (not a circular or strip chart) of the injection rate for at least 48 hours prior to shutin, or from the last time the well was shutin and the reservoir pressure stabilized should be submitted for all communicable wells in the formation being tested.
12. All data, including verification of the viscosity of the fluid through which the pressure transients of the infinite acting portion of the test were propagating, should be submitted. All equations used in the analysis should be provided with the appropriate parameters substituted into the equations. Any abnormal data fluctuations should be explained.
13. A 3-1/2 inch diskette containing the unedited falloff test data must be submitted. The data associated with the buildup portion of the test, if available, should also be included. This data should be in the form of an ASCII file and should include the time, pressure, and rate data of the test. In addition, the parameter units format (hh:mm:ss, hours, etc.) should be indicated. More than one falloff test data set can be contained on a diskette.
14. Any test that was not shutin long enough to develop an infinite acting period, or one that cannot be properly analyzed for the kh/μ parameter group using Horner techniques, should be rerun unless other arrangements have been made with EPA staff.
15. Any unorthodox testing procedure, or any testing of a well with known or anticipated problems, should be discussed with EPA staff prior to performing the test.

COMPUTER SOFTWARE

Due to the accuracy and high frequency of data acquisition of modern pressure gauges, the use of well testing computer software is now a standard tool of falloff test analysis. EPA Region 6 has acquired such a software package and will be using it to analyze falloff tests, especially those that are complicated by unusual events or those that result in anomalous conclusions. Therefore, a diskette containing the unedited falloff test data is required to be submitted along with the test. Operators are encouraged to employ well testing software that has the capability of pressure

history simulation using non-linear regression. This feature allows operators to simulate the entire falloff test, including transitional periods, and to compare this simulation to the actual data. This is done by using either a fixed set of parameters calculated by the falloff test analysis, or by allowing these parameters to vary within a selected range, until the simulation most closely matched the actual data. Confidence intervals can then be calculated as a check of how well the simulated data matches the actual data. This type of analysis is particularly useful in the recognition of boundaries, or unusual reservoir characteristics, such as dual porosity. It should be noted that type curve matching is not considered a substitute, but is a compliment to, a traditional Horner based analysis.

APPROPRIATE FLOW RATE

In theory, the time required to achieve a particular radius of investigation is independent of the flow rate. However, in practice, the flow rate must be large enough such that pressure changes with time can be recorded with sufficient precision to be useful for analysis. This is especially important for very transmissive reservoirs in which pressure transients are dissipated rapidly.

It is common practice in the performance of a falloff test to begin by shutting in the well to allow the reservoir pressure to stabilize. Following this, brine is usually brought in and the injection portion of the test is begun. This ensures that only those pressure transients propagated during the injection portion of the test influence the falloff portion of the test. However, if the wellhead is rigged for a lubricator, it is possible to employ the wastestream as the injection fluid and lower the pressure gauge into the well without any interruption of the injection rate. Alternatively, the use of a surface gauge affords the same opportunity to use the waste stream as the injection fluid without interruption of the injection rate. Use of the waste stream as the injection fluid affords several distinct advantages:

- a) Brine does not have to be purchased.
- b) The length of the injection period is not limited by economics - the amount of brine purchased. This can result in a better test due to a greater pressure buildup in the reservoir. Consequently, more pressure falloff can occur during the infinite acting portion of the test, which minimizes the effect of data fluctuations.
- c) The overall test period is reduced due to the elimination of a separate injection period. This results in less down time.

Regardless of the injection fluid employed, the injection rate should be held as constant as possible. As stated earlier, the significance of rate interruptions or changes in rate increase as they occur closer to the shutin period. If a rate change occurs during the injection portion of the test, such as when a lubricator is rigged up, several methods are available to treat this occurrence:

- a) The well can be shutin until the reservoir pressure equilibrates and the injection period started over.
- b) The injection rate can be held constant from this point forward until the effect of the rate interruption is insignificant. The additional injection time required for the rate interruption to have an insignificant effect on the falloff test will depend on the particular reservoir parameters under consideration.
- c) The rate change can be accounted for by using the principal of superposition in time. In this method, the effects of individual rate changes are added together as if they were separate wells injecting at the same location. However, a gradual change in rate may be difficult to treat in this manner.

PRESSURE DERIVATIVE ANALYSIS

The pressure derivative curve is a log-log plot of the change in slope of the semilog plot of pressure with respect to time. It may be employed for several reasons, such as recognition of the beginning of the infinite acting portion of the test and other flow regimes, and restrictive boundaries. The derivative plot allows a more accurate determination of the start of the infinite acting portion of the test, in comparison with the traditional method of simply proceeding one and one half log cycles past the end of the unit slope line on the log-log plot of the pressure versus time data. Indeed, it is advantageous to have the ability to plot a derivative curve while the falloff test is being performed in order to ensure that the well has been shutin long enough to be comfortably in the infinite acting flow regime. Characteristically, this period can be identified by a flattening out of the derivative curve. The start of the infinite acting portion of the test must be displayed on both the derivative and Horner plots.

The derivative must be displayed on a log P' vs. log Δt scale, a log P' vs. log "equivalent time" scale, or in unusual circumstances, some other time format. The equivalent time concept is credited to R. G. Agarwal and is employed to account for the injection history prior to shutin. This time is calculated as follows:

$$t_{eqv} = \frac{t_p \Delta t}{t_p + \Delta t}$$

where t_{eqv} = Agarwal equivalent time, hours
 t_p = injection time, hours
 Δt = shutin time, hours

The use of equivalent time can be more appropriate than a log delta time scale, which ignores the injection history and may distort the derivative plot to the point where nonexistent boundaries are perceived. This can occur because the transient due to the injection period preceding shutin influences the shape of the derivative. EPA frequently encounters reports in which the derivative is only displayed on a log P_D' (dimensionless pressure) vs. log t_D / C_D (dimensionless time divided by dimensionless wellbore storage coefficient) scale. This presents a problem to the reviewer in that points cannot be directly transferred from the derivative plot to the Horner plot. In addition, the only way to display the dimensionless plot is by first knowing the dimensionless quantities, which are functions of, in part, the kh/μ product. This requires that the dimensionless plot be constructed from either a curve matching technique, or that the Horner analysis is done first and the dimensionless quantities then calculated. In either case the derivative displayed using dimensionless quantities can only be constructed after the well test has been analyzed, which defeats one of the principal purposes of constructing the derivative - the detection of the infinite acting portion of the test. This knowledge should be acquired before the well test is analyzed. Following a conventional Horner analysis, a dimensionless derivative plot may be matched by a curve fitting technique to further support the analysis.

VISCOSITY SELECTION

It is not unusual, in cases in which the viscosity of the historically injected fluid varies significantly from that of the formation fluid, for the resulting mobility ratio $(k/\mu)_w / (k/\mu)_f$ change (where the subscripts "w" and "f" refer to the waste and formation fluid, respectively) to be reflected in the Horner plot by a change in slope. The infinite acting portion of the derivative curve should also change and level to another value. Eliminating alternative geologic causes, such as a sealing fault, multiple layers, dual porosity, etc., leads to the interpretation of this change in slope as representing the boundary of the two fluid banks.

This problem is most commonly resolved by first assuming that the pressure transients were propagating through the formation fluid during the infinite acting portion of the test, and later verifying that this assumption was correct. This is generally a good strategy except for a few facilities with exceptionally long injection histories, and consequently, large waste plumes. The time for the pressure transient to exit the waste front is first calculated. This time is then plotted on the derivative and Horner plots. The start of the infinite acting portion of the test is then verified to have occurred after this time. The specific steps involved are as follows:

The time necessary for a pressure transient to traverse a given radius can be calculated as follows (Lee, J.: *Well Testing*, Society of Petroleum Engineers of AIME, Dallas (1982), page 15, Equation 1.47):

$$t = \frac{948r_i^2\phi\mu c_i}{k}$$

where r_i = radius of investigation, ft
 k = permeability, md
 t = time injected, hrs
 ϕ = porosity, fraction
 c_i = total compressibility, psi^{-1}
 μ = viscosity of fluid at reservoir conditions, cp

The distance to the waste front can then be estimated volumetrically using the following equation:

$$r = \left(\frac{0.13368V}{\pi h \phi} \right)^{1/2}$$

where V = cumulative injection into completed interval only, gal
 r = estimated distance to waste front, ft
 h = interval thickness, ft
 ϕ = porosity, fraction
 π = approximately 3.14

It follows that the time necessary for a pressure transient to exit the waste front can be found by substituting the radius equation into the time equation:

$$t_w = \frac{126.73 \mu c_i V}{\pi k h}$$

where V = cumulative injection into completed interval only, gal
 h = interval thickness, ft
 ϕ = porosity, fraction
 π = approximately 3.14
 μ_w = viscosity of historic waste plume at reservoir conditions, cp

This time should be plotted on both the derivative and Horner plots. If, the time necessary for a pressure transient to exit the waste front occurs before the start of the infinite acting period, the assumption that the pressure transients were propagating through the reservoir fluid during the infinite acting period was correct. The viscosity of the reservoir fluid is then the appropriate viscosity to use in analyzing the well test. If not, then the viscosity of historic waste plume should be employed. In either case, adequate information must be presented in order that the viscosity of the appropriate fluid, at reservoir conditions, can be verified. The thickness of the injection interval should also be justified. This should include the disclosure of the existence and top of any wellbore fill, and whether or not the injection interval is composed of hydraulically isolated units or a single massive unit. In certain instances, particularly when hydraulically isolated sands are present, it may be necessary to define the amount of flow entering the fill through the use of a flow profile survey. In order to avoid interpretation problems, operators are encouraged to regularly remove any fill from the wellbore.

HORNER PLOT ANALYSIS

The start of the infinite acting portion of the test should be transferred from the derivative plot to the Horner plot. In addition, if other than a direct reading scale was employed in the derivative plot, such as Agarwal time, any information necessary to convert this point from the derivative plot to the Horner plot should be provided. This time approximates the point when the pressure transient has moved beyond the influence of the altered zone near the well and when wellbore storage has ceased distorting the pressure falloff test data. At this time the semilog straight line whose slope is related to formation permeability can be observed on the Horner plot. This straight line ordinarily will continue until the radius of investigation reaches one or more reservoir boundaries, massive heterogeneities, a fluid/fluid contact, or runs out of measurable pressure transients. The slope

of the Horner plot (m) is used to determine the (kh/μ) parameter group from the following equation:

$$\frac{kh}{\mu} = \frac{162.6qB}{m}$$

where: m = slope of the Horner plot, psi/cycle
 q = injection rate, bpd
 B = formation volume factor, rvb/stb
 h = interval thickness, ft
 μ = appropriate viscosity at reservoir conditions, cp
 k = permeability, md

The slope employed in the above equation should be drawn on the Horner plot and expanded Horner plot. It should represent only the infinite acting portion of the test, as indicated by the derivative plot.

WELLBORE SKIN AND FLOWING BOTTOMHOLE PRESSURE

In theory, wellbore skin is treated as an infinitesimally thin sheath surrounding the wellbore, through which a pressure drop occurs due to either damage or stimulation. Industrial injection wells deal with a variety of waste streams that alter the near wellbore environment due to precipitation, fines migration, ion exchange, bacteriological processes, and other mechanisms. It is reasonable to expect, and there is evidence to support the fact, that this alteration often exists as a zone surrounding the wellbore and not a skin. Therefore in practice, at least in the case of industrial injection wells, the assumption that skin exists as a thin sheath is not always valid. This does not pose a serious problem to the correct interpretation of falloff testing except in the case of a large zone of alteration, or in the calculation of the flowing bottomhole pressure. EPA has seen several instances in which large zones of alteration were suspected of being present. These cases have been matched using composite reservoir simulations with mixed results. This is obviously an area which could benefit by additional research. In the interim, EPA will rely on the traditional approach. The equation typically employed to characterize skin is as follows:

$$S = 1.1513 \left[\frac{p_{1hr} - p_{wf}}{m} - \log \left(\frac{kt_p}{(t_p + 1)\phi\mu c_r r_w^2} \right) + 3.2275 \right]$$

where: s = skin factor, dimensionless

p_{1hr} = pressure intercept along the straight line portion of the Horner plot at a shutin of 1 hour, psi.

p_{wf} = measured flowing bottomhole pressure at $\Delta t = 0$, psi

μ = appropriate viscosity at reservoir conditions, cp

m = slope of the Horner plot, psi/cycle

k = permeability, md

ϕ = porosity, fraction

c_t = total compressibility, psi^{-1}

r_w = wellbore radius, feet

t_p = injection time, hours

It can be seen that this equation deviates from the usual equation employed for skin in that the factor, $t_p/(t_p + \Delta t)$, where $\Delta t = 1\text{hr}$, appears in the log term. This term is usually assumed to result in a negligible contribution to the skin factor and is therefore left out of the equation. However, for relatively short injection periods this term can be significant.

Although the skin factor concept is useful for estimating the degree of damage or stimulation to the well, its use in this guideline is limited to the calculation of the flowing bottomhole pressure. The adjusted flowing bottomhole pressure is calculated by subtracting the pressure due to skin, in the usual case of a damaged well, from the flowing bottomhole pressure:

$$P_{wfa} = P_{wf} - 0.868ms$$

where: P_{wfa} = adjusted bottomhole flowing pressure, psi

P_{wf} = measured flowing bottomhole pressure at $\Delta t = 0$, psi

s = skin factor, dimensionless

m = slope of the Horner plot, psi/cycle

From the above equation, it can be seen that the adjusted bottomhole flowing pressure is directly dependant on a single point - the last flowing pressure recorded prior to shutin. Therefore, an accurate recording of this point is an important step in obtaining the skin factor in this manner. Consequently, any unusual data fluctuations or nonstandard pressure responses in the immediate area of this point should be viewed with suspicion.

PRESSURE GAUGES

Calibration checks of gauges should be made before and after each test using a dead weight tester. Gauges should also be calibrated by the manufacturer at least annually, or when the dead weight tester indicates that the gauge is out of the manufacturer's specifications. Manufacturer's recommendations, if different than this calibration interval, should be followed. Along with the falloff testing report, the manufacturer's recommended frequency of calibration, and a gauge calibration certificate should be provided demonstrating that this practice has been followed.

COMPARISON TO PETITION DATA

A comparison between the falloff test results and the parameters used in the no migration petition demonstration should be made. Specifically, the following should be demonstrated:

1. Both the flowing and static bottom hole pressures measured during the test should be at or below those which were predicted to occur by the pressure buildup model for the same point in time.
2. It should be shown that the (kh/μ) parameter group calculated from the current falloff data is the same or greater than that employed in the pressure buildup modeling.
3. If in the original petition, the permeability calculated from falloff testing was employed in determining a background reservoir velocity, that permeability should be compared to that derived from the current falloff test.

REPORT FOR EPA

A detailed report should be submitted to Region 6 summarizing the results of the falloff test with the parameters used in the no migration demonstration. The report should include all raw data, a discussion of the testing procedure, all graphs and calculations, interpretations and conclusions from the test, and a comparison of all parameters with those used in the petition demonstration including references where the parameters can be found in the petition. The report should include the following data:

A. Falloff Test Data

1) General Test Information

Date of test

Time since reservoir pressure was last stabilized

Cumulative injection into completed interval
Wellbore radius
Completed interval
Type of completion
Depth to fill
Justified interval thickness
Average historical waste fluid viscosity
Formation fluid viscosity
Porosity
Total compressibility
Formation volume factor
Initial formation bottom hole pressure and temperature

2) Injection Period
Time of injection period
Test fluid
Injection rate graph for all wells completed in the test interval
Pumps used for test
Injection fluid viscosity
Method and times viscosity tested
Final injection pressure and temperature
Gauge type (Panex, HP, etc)
Gauge resolution and calibration check
Gauge depth

3) Falloff Period
Total shutin time
Final shutin pressure and temperature

B. Calculated Test Data

Distance to waste front
Radius of investigation
Time to beginning of infinite acting portion of test (from derivative)
Horner time to beginning of infinite acting portion of test
Slope or slopes from Horner plot
 kh/μ
Permeability (range based on values of h)
Skin

C. Gauge calibration certification

TIMING OF REPORT SUBMISSION (PLEASE NOTE REVISIONS)

The testing discussed above must be conducted within one year from the date of petition approval, unless prior authorization for an extension or alternative due date has been granted by EPA. In

21
AUG 19 1993

AUG - 5 1993

CERTIFIED MAIL P 106 970 818 RETURN RECEIPT REQUESTED

Mr. I.O. Coleman, Jr.
Environmental Affairs Section Leader
Hoechst Celanese Corporation
Bay City Plant
P.O. Box 509
Highway 3057
Bay City, TX 77404-0509

Dear Mr. Coleman:

The EPA has reviewed the revised falloff test procedures for WDW-32 and WDW-49 dated July 16, 1993 and finds them acceptable. The EPA falloff testing guidelines recommend all offset wells be shut in prior to and during the falloff test. Celanese has stated that shutting in all offset wells is not feasible at the Bay City site. Celanese has proposed a procedure that should minimize the effects of offset injection. Celanese will be responsible for running valid well tests. Should these procedures result in well tests that are unanalyzable, Celanese may be required to rerun the tests using an alternate procedure.

Celanese is strongly urged to review the falloff testing guidelines prior to submitting the falloff test report. The format of previous reports submitted by Celanese has not included the data requested in the guidelines, therefore resulting in numerous deficiencies prior to evaluation of the test. The report should be submitted within 45 days of the test date. This report should include the requested documentation of parameters, calculations, and data.

Please contact Phil Dellinger at (214) 655-7142 if you have any questions.

Sincerely yours,

Mac A. Weaver, P.E.
Chief
UIC State Programs Section

cc: Ben Knape, TWC

OPTIONAL FORM 99 (7-90)

FAX TRANSMITTAL		# of pages ▶ 1
To	I.O. Coleman	
From	Phil Dellinger	
Dept./Agency	Celanese	
Phone #	(214) 655-7142	
Fax #	(409) 841 4141	

NSN 7540-01-317-7368 5099-101 GENERAL SERVICES ADMINISTRATION

6W-SU:8/19/93:DELLINGER:MH:H:\LBAN\WP50\CELANESE.BA\BAYCPROC.LTR

PD 8/19/93

Chemical Group
Hoechst Celanese Corporation
Bay City Plant
PO Box 509
Highway 3057
Bay City, TX 77404-0509

July 16, 1993
IOC-062-93

FEDERAL EXPRESS

Mr. Phil Dellinger
UIC State Programs Section (6W-SU)
U. S. Environmental Protection Agency
1445 Ross Ave., Suite 1200
Dallas, TX 75202-2733

**SUBJECT: REVISED ANNUAL 1993 BOTTOM HOLE PRESSURE FALLOFF
PROCEDURES, WASTE DISPOSAL WELLS, WDW-32 AND
WDW-49, HOECHST CELANESE CHEMICAL GROUP, INC.,
BAY CITY PLANT, BAY CITY, TEXAS
(REF. LETTER, IOC-046-93, DATED JUNE 4, 1993)**

Dear Mr. Dellinger:

For your review and approval, please find attached the revised (7/16/93) field procedures (Addendum I) prepared by Golden Environmental Services for the annual bottom hole pressure falloff tests on WDW-32 and WDW-49. Falloff testing on these wells is anticipated to be performed late September or early October 1993.

Please comment in writing on these procedures as soon as possible, preferably on or before August 2, 1993. The quick comment period is requested to allow sufficient time to modify our Plant operations to accomodate the approved test procedures.

If you have any questions, contact me at 409/241-4197.

Very truly yours,

I. O. Coleman, Jr.

I. O. Coleman, Jr.

IOC/cjs
attachment

RECEIVED
WATER SUPPLY BRANCH
93 JUL 19 PM 2:06
6W-S

7/16/93

cc: Mr. Mac A. Weaver, P.E., Chief
UIC State Programs Section (6W-SU)
U. S. Environmental Protection Agency
Region 6
1445 Ross Ave., Suite 1200
Dallas, TX 75202-2733

Mr. Joe Kordzi
UIC State Programs Section (6W-SU)
U. S. Environmental Protection Agency
Region 6
1445 Ross Ave., Suite 1200
Dallas, TX 75202-2733

Mr. Richard Merritt, Permit Coordinator
Underground Injection Control Unit
Industrial and Hazardous Waste Division
Texas Water Commission
P. O. Box 13087
1700 North Congress Ave.
Austin, TX 78711-3087



BOTTOM HOLE PRESSURE FALLOFF TESTING
WDW NOS. 32 & 49

HOECHST CELANESE - CHEMICAL GROUP
BAY CITY, TEXAS

Prepared by Golden Environmental Services

- 1) WDW-49 is to be brined in prior to conducting bottom hole pressure falloff testing.
- 2) At least 48 hour prior to conducting bottom hole pressure testing, reduce the injection rates as low as possible on the wells remaining in service, WDW-110 and WDW-14, during the falloff testing.
- 3) Maintain high constant injection rates on WDW-32 prior to conducting falloff test on same.
- 4) Install surface readout bottom hole pressure gauges in WDW-32.
- 5) Conduct bottom hole pressure falloff testing on WDW-32.
- 6) Remove bottom hole pressure gauge from WDW-32. Leave WDW-32 shut-in.
- 7) Place WDW-49 back in service for approximately one week prior to conducting falloff testing on same.
- 8) At least 48 hour prior to conducting bottom hole pressure testing on WDW-49, reduce the injection rates as low as possible on WDW-14 and WDW-110.
- 9) Maintain high constant injection rates on WDW-49.
- 10) Conduct bottom hole pressure test on WDW-49.
- 11) Place wells back in service.



Hoechst Celanese

(4)

Chemical Group

Hoechst Celanese Corporation
Bay City Plant
PO Box 509
Highway 3057
Bay City, TX 77404-0509

July 12, 1993
IOC-059-93

CERTIFIED MAIL

Mr. Mac A. Weaver, P. E.
Chief
UIC State Programs Section (6W-SU)
United States Environmental Protection Agency
Region 6
1445 Ross Avenue, Suite 1200
Dallas, Texas 75202-2733

Subject: Response To EPA Letter (Attached as Addendum I)
Dated March 25, 1993 Relative To 1992 and 1993
Falloff Tests Conducted On WDW-32, WDW-49 and
WDW-110
Hoechst Celanese Chemical Group, Inc.
Bay City Plant, Bay City, Texas

Dear Mr. Weaver:

Enclosed herewith, in a report format, is our response to the list of deficiencies attached to the above letter. The report, generated by our consultants, Golden Environmental Services, Inc., is provided for your review and approval.

Please contact me by telephone at 409/241-4197 should you have questions and/or comments pertaining to the report.

Very truly yours,



I. O. Coleman, Jr.

cjs
attachment

RECEIVED
WATER SUPPLY BRANCH
93 JUL 14 PM 3:03
6W-S

7/12/93

cc: Mr. Phil Dellinger
UIC State Programs Section (6W-SU)
U. S. Environmental Protection Agency
Region 6
1445 Ross Avenue, Suite 1200
Dallas, TX 75202-2733

Mr. Joe Kordzi - w/o attachment
UIC State Programs Section (6W-SU)
U. S. Environmental Protection Agency
Region 6
1445 Ross Avenue, Suite 1200
Dallas, TX 75202-2733

Mr. Ben Knappe
Geologist
Texas Water Commission
P. O. Box 13087, Capitol Station
Austin, TX 78711-3087

Mr. Richard Merritt, Geologist
Texas Water Commission
P. O. Box 13087, Capitol Station
1700 North Congress Ave.
Austin, TX 78711-3087





ADDENDUM I
UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 6
1445 ROSS AVENUE, SUITE 1200
DALLAS, TX 75202-2733

June 25, 1993

CERTIFIED MAIL P 176 167 075 RETURN RECEIPT REQUESTED

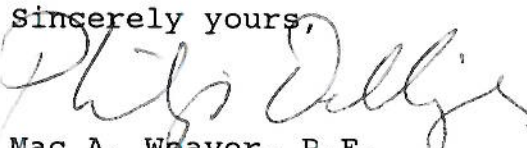
Mr. I.O. Coleman, Jr.
Environmental Affairs Section Leader
Hoechst Celanese Corporation
Bay City Plant
P.O. Box 509
Highway 3057
Bay City, TX 77404-0509

Dear Mr. Coleman:

The proposed pressure falloff procedures for WDW-32 and WDW-49 have been reviewed and comments enclosed. The responses to the March 3, 1993, deficiencies have also been evaluated and additional deficiencies identified. Please respond to these deficiencies by July 12, 1993.

Please contact Phil Dellinger at (214) 655-7142 if you have any questions.

Sincerely yours,

for 
Mac A. Weaver, P.E.
Chief
UIC State Programs



ADDENDUM I (cont'd)

EPA COMMENTS ON PROPOSED 1993 FALLOFF TEST PROCEDURES
FOR WDW-32 AND WDW-49
June 25, 1993

- Item No. 1: No comment.
- Item No. 2: It is recommended the falloff tests for WDW-32 and WDW-49 be run separately to prevent any interference between the two wells. A falloff test and corresponding interference test may also be considered as an option.
- It is further recommended Celanese use a constant injection rate of 200 gpm for the injectivity period prior to falloff to test both WDW-32 and WDW-49. Celanese is proposing to inject 50 gpm into WDW-32 and 40 gpm into WDW-49. These rates are well below the 87 gpm and 80 gpm injected into the wells during the 1992 well tests. The 1992 well test for WDW-14 and the 1993 well test for WDW-110 both injected at a 200 gpm rate prior to shut in. The falloff tests for WDW-14 and WDW-110 had clearly defined regions of radial flow. The 1992 falloff tests for WDW-32 and WDW-49 did not result in well defined radial flow regions. The injection rates prior to shut in appear to have a strong impact on the falloff test results.
- Celanese stated that nonhazardous waste will be injected into WDW-32 and WDW-49 prior to falloff. Plant waste can be used as the injected fluid provided it is of a relatively constant viscosity and there are no compatibility problems with the pressure gauge.
- Item No. 3: Celanese should also record the injection rates for WDW-14 and WDW-110 during the falloff testing period. These rates should be submitted on a cartesian graph in the report to the EPA.
- Item No. 4: No comment.
- Item No. 5: No comment.
- Item No. 6: A falloff period of 48 hours may not be required. The falloff test should be run long enough so that several data points lie within the radial flow portion and the semilog straight line should be well developed. In the 1993 falloff test for WDW-110, the falloff test was run for 18 hours.
- Item No. 7: No comment.
- Item No. 8: No comment.

ADDENDUM I (cont'd)

injection time (t) and a final falloff time of 48 hours (Δt), the resulting Horner time and Agarwal equivalent time do not correspond to the end points observed on the semilog and log-log plots shown for WDW-49. Celanese should verify that the proper units were assigned to the input data. Celanese should provide a revised log-log plot, semilog plot, and analysis for the WDW-49 1992 falloff test.

2. Celanese should provide a diskette containing the unedited falloff test data. Celanese should specify the parameter and units for each column of data submitted.

4
JUN 25 1993

CERTIFIED MAIL P 176 167 075 RETURN RECEIPT REQUESTED

Mr. I.O. Coleman, Jr.
Environmental Affairs Section Leader
Hoechst Celanese Corporation
Bay City Plant
P.O. Box 509
Highway 3057
Bay City, TX 77404-0509

Dear Mr. Coleman:

The proposed pressure falloff procedures for WDW-32 and WDW-49 have been reviewed and comments enclosed. The responses to the March 3, 1993, deficiencies have also been evaluated and additional deficiencies identified. Please respond to these deficiencies by July 12, 1993.

Please contact Phil Dellinger at (214) 655-7142 if you have any questions.

Sincerely yours,

Mac A. Weaver, P.E.
Chief
UIC State Programs

6W-SU:6/25/93:DELLINGER:MH:H:\LBAN\WP50\CELANESE\CELANESE.BA\
BAYCTY93.TST

EPA COMMENTS ON PROPOSED 1993 FALLOFF TEST PROCEDURES
FOR WDW-32 AND WDW-49
June 25, 1993

Item No. 1: No comment.

Item No. 2: It is recommended the falloff tests for WDW-32 and WDW-49 be run separately to prevent any interference between the two wells. A falloff test and corresponding interference test may also be considered as an option.

It is further recommended Celanese use a constant injection rate of 200 gpm for the injectivity period prior to falloff to test both WDW-32 and WDW-49. Celanese is proposing to inject 50 gpm into WDW-32 and 40 gpm into WDW-49. These rates are well below the 87 gpm and 80 gpm injected into the wells during the 1992 well tests. The 1992 well test for WDW-14 and the 1993 well test for WDW-110 both injected at a 200 gpm rate prior to shut in. The falloff tests for WDW-14 and WDW-110 had clearly defined regions of radial flow. The 1992 falloff tests for WDW-32 and WDW-49 did not result in well defined radial flow regions. The injection rates prior to shut in appear to have a strong impact on the falloff test results.

Celanese stated that nonhazardous waste will be injected into WDW-32 and WDW-49 prior to falloff. Plant waste can be used as the injected fluid provided it is of a relatively constant viscosity and there are no compatibility problems with the pressure gauge.

Item No. 3: Celanese should also record the injection rates for WDW-14 and WDW-110 during the falloff testing period. These rates should be submitted on a cartesian graph in the report to the EPA.

Item No. 4: No comment.

Item No. 5: No comment.

Item No. 6: A falloff period of 48 hours may not be required. The falloff test should be run long enough so that several data points lie within the radial flow portion and the semilog straight line should be well developed. In the 1993 falloff test for WDW-110, the falloff test was run for 18 hours.

Item No. 7: No comment.

Item No. 8: No comment.

HOECHST CELANESE BAY CITY PLANT
Notice of Deficiencies for the 1992 and 1993 Falloff Tests
June 25, 1993

1993 Falloff test for WDW-110:

1. Celanese should provide a delta P (psi) vs delta t (hours) log-log plot with derivative. This plot should be scaled to include all analyzed data. The start of radial flow should be identified on the plot. A dimensionless pressure vs dimensionless time scaled log-log plot represents a problem to the reviewer in that time cannot be directly read and converted for use on the Horner plot. In addition, calculation of the dimensionless parameters require knowing quantities which are functions, in part, of the kh/μ product.
2. Celanese should provide a diskette containing the unedited falloff test data. Celanese should specify the parameter and units for each column of data submitted.

WDW-32 (Well No. 3) September 14-15, 1992 falloff test:

- corrected on orig. -*
1. The May 3, 1993 Deficiency No. 1 requested Celanese to state and justify the injection time interval used to calculate the Horner time of the semilog plot and the Agarwal equivalent time on the log-log plot. The response by Celanese did not address this deficiency. For the September, 1992 test for WDW-32, Celanese should state the value used for the injection time (t), used to determine Horner time $[(t + \Delta t)/\Delta t]$ and Agarwal equivalent time $[(t * \Delta t)/(t + \Delta t)]$. Celanese reported a corrected flow time of 8760 hrs for the test in the analysis. Using the final shut-in Δt of 46.46 hrs and an injection time, $t = 8760$ hrs, the corresponding Horner time would be 189.5 and the corresponding Agarwal equivalent time would be 46.2, neither of which appear as the final points on the corresponding plots. Celanese should verify the values assigned for Δt and injection time (t). Celanese should revise the log-log plot, semilog plot, and falloff test analysis submitted.
 2. Celanese should provide a diskette containing the unedited falloff test data. Celanese should specify the parameter and units for each column of data submitted.

WDW-49 (Well No. 4) September 19-22, 1992 falloff test:

1. Celanese stated in the response to the March 3, 1993 Deficiency No. 2, that the corrected flow time of 8760 hours equaled the total elapsed time. Using 8760 hours for the

injection time (t) and a final falloff time of 48 hours (Δt), the resulting Horner time and Agarwal equivalent time do not correspond to the end points observed on the semilog and log-log plots shown for WDW-49. Celanese should verify that the proper units were assigned to the input data. Celanese should provide a revised log-log plot, semilog plot, and analysis for the WDW-49 1992 falloff test.

2. Celanese should provide a diskette containing the unedited falloff test data. Celanese should specify the parameter and units for each column of data submitted.

Chemical Group

Hoechst Celanese Corporation
Bay City Plant
PO Box 509
Highway 3057
Bay City, TX 77404-0509

June 4, 1993
IOC-046-93

FEDERAL EXPRESS

Mr. Phil Dellinger
UIC State Programs Section (6W-SU)
U. S. Environmental Protection Agency
1445 Ross Ave., Suite 1200
Dallas, TX 75202-2733

**SUBJECT: ANNUAL 1993 BOTTOM HOLE PRESSURE FALLOFF PROCEDURES
WASTE DISPOSAL WELLS, WDW-32 AND WDW-49
HOECHST CELANESE CHEMICAL GROUP, INC.,
BAY CITY PLANT, BAY CITY, TEXAS**

Dear Mr. Dellinger:

For your review and approval, please find attached the field procedures (Addendum I) prepared by Golden Environmental Services for the annual bottom hole pressure falloff tests on WDW-32 and WDW-49. Falloff testing on these wells is anticipated to be performed late September or early October 1993.

Please comment in writing on these procedures as soon as possible, preferably on or before June 23, 1993. The quick comment period is requested to allow sufficient time to modify our Plant operations to accomodate the approved test procedures.

Falloff testing on our other two wells, WDW-14 and WDW-110, will occur in February 1994. Bottom hole pressure falloff procedures will be submitted for these wells when the falloff testing is closer at hand.

If you have any questions, contact me at 409/241-4197.

Very truly yours,



I. O. Coleman, Jr.

IOC/cjs
attachment



6/3/93

cc: Mr. Mac A. Weaver, P.E., Chief
UIC State Programs Section (6W-SU)
U. S. Environmental Protection Agency
Region 6
1445 Ross Ave., Suite 1200
Dallas, TX 75202-2733

Mr. Joe Kordzi
UIC State Programs Section (6W-SU)
U. S. Environmental Protection Agency
Region 6
1445 Ross Ave., Suite 1200
Dallas, TX 75202-2733

Mr. Richard Merritt, Permit Coordinator
Underground Injection Control Unit
Industrial and Hazardous Waste Division
Texas Water Commission
P. O. Box 13087
1700 North Congress Ave.
Austin, TX 78711-3087



6/3/93

bcc: J. L. Popejoy - w/o attached document
N. C. Stafford - " " "
Mr. Tom Jones - Golden Strata - " " "
K. Williams
R. S. O'Neal
H. R. Horton
E. H. Chiu
R. E. Bennett
B. A. Logue
E. A. Wilson
Anne Conely-Pitchell - Bridgewater
Environmental File No. 203.16



**TEST PROGNOSIS FOR HOECHST CELANESE BAY CITY
WDW 32 AND 49**

1. At least 48 hours prior to shut-in, injection rates into WDW 110 and WDW 14 should be reduced to as low a level as operations permit.
2. Inject nonhazardous waste into WDW 32 and WDW 49 at constant flowrate for at least 48 hours. Recommended rates are 50 gpm and 40 gpm respectively.
3. Record injection rates in all wells for at least 48 hours prior to the projected start of the falloff test. ✓
4. Move in and rig up wireline unit, lubricator and surface read-out bottom hole pressure gauges on WDW 32 and WDW 49. While maintaining constant flow, run gauges and hang at approximately 3350 feet (datum = 3440 feet) in both wells.
5. Take samples of injectants of both wells, record injection temperatures and send to laboratory for measurement of viscosities and specific gravities at injection temperature and reservoir temperature (105°F).
6. After pressure gauges have been set at approximately 3350' for at least 2 hours to equilibrate with temperature, shut-in wells simultaneously as quick as possible and record pressure fall-off for 48 hours.
7. Retrieve pressure gauges, making 3-5 minute gradient stops every 500 feet.
8. Return wells to service.

JHH:rsm

JUN - 7 1993



Chemical Group
Hoechst Celanese Corporation
Bay City Plant
PO Box 509
Highway 3057
Bay City, TX 77404-0509

May 20, 1993
IOC-042-93

Mr. Mac A. Weaver, P. E.
Chief
UIC State Programs Section (6W-SU)
United States Environmental Protection Agency
Region 6
1445 Ross Avenue, Suite 1200
Dallas, Texas 75202-2733



Subject: **Response To EPA Letter Dated March 3, 1993 Relative To
1990, 1991, 1992 and 1993 Bottom Hole Pressure Falloff
Tests Conducted On WDW-14, WDW-32, WDW-49 and WDW-110
Hoechst Celanese Chemical Group, Inc.
Bay City Plant, Bay City, Texas**

Dear Mr. Weaver:

Enclosed herewith, in a report format, is our response to the list of deficiencies attached to the above letter. The report, generated by our consultants, Golden Environmental Services, Inc., is provided for your review and approval.

It should be noted that several of the deficiencies were on pressure falloff tests conducted in 1990 and 1991. As such, these tests were performed prior to issuance of the EPA Region 6 "Pressure Falloff Testing Guidelines".

Please contact me by telephone at 409/241-4197 should you have questions and/or comments pertaining to the report.

Very truly yours,

I. C. Coleman, Jr.

cjs
attachment

cc: Mr. Phil Dellinger
UIC State Programs Section (6W-SU)
U. S. Environmental Protection Agency
Region 6
1445 Ross Avenue, Suite 1200
Dallas, TX 75202-2733

Mr. Joe Kordzi - w/o attachment
UIC State Programs Section (6W-SU)
U. S. Environmental Protection Agency
Region 6
1445 Ross Avenue, Suite 1200
Dallas, TX 75202-2733

Mr. Ben Knape
Geologist
Texas Water Commission
P. O. Box 13087, Capitol Section
Austin, TX 78711-3087



TEST PROGNOSIS FOR HOECHST CELANESE BAY CITY WDW 32-3 AND 49-4

1. The potential for interference exists from the other two wells. (WDW 110-A and WDW 14-2). At least 48 hours prior to shut-in, injection rates in these two wells should be reduced to as low a level as operations permit.

2. Inject waste into WDW 32-3 and WDW 49-4 at constant rate for at least 48 hours. Recommended rates are 50 gpm and 40 gpm respectively.

3. Record injection rates in all wells for at least 48 hours.

4. Move in and rig up wireline unit, lubricator and surface read-out bottom hole pressure gauges. Run gauges and hang at approximately 3350 feet (datum = 3440 feet) in both wells.

5. Take samples of injectants of both wells, record injection temperatures and send to laboratory for measurement of viscosities and specific gravities at injection temperature and reservoir temperature (105°F).

6. After pressure gauges have been on bottom for at least 2 hours to equilibrate with temperature, shut-in wells simultaneously and record pressure fall-off for 48 hours.

7. Retrieve pressure gauges, making gradient stops every 500 feet.

8. Download pressure data to 3 1/2" disk in ASCII format and forward to Golden Environmental Services.

9. Provide Golden with monthly injection volumes from the two test wells from the time that they were last shut-in.

10. Return wells to service.

JHH:rsm

JUN - 7 1993

US-W-6



(4)
MAY 3 1993

CERTIFIED MAIL P 176 167 084 RETURN RECEIPT REQUESTED

Mr. I.O. Coleman, Jr.
Environmental Affairs Section Leader
Hoechst Celanese Corporation
Bay City Plant
P.O. Box 509
Highway 3057
Bay City, TX 77404-0509

Dear Mr. Coleman:

The EPA has reviewed all well falloff tests for the Celanese Bay City facility and the responses to EPA deficiencies from its initial review of the tests. The original reports submitted did not include the documentation of parameters, calculations, or data as outlined in the Region 6 Pressure Falloff Testing Guidelines. Several well tests appear to have been influenced by offset injection. The EPA recommends that Celanese submit the testing procedures for future 1993 falloff tests for comment prior to testing.

Attached are comments and deficiencies identified during this review. Please respond to these deficiencies by May 21, 1993.

Please contact Phil Dellinger at (214) 655-7142 if you have any questions.

Sincerely yours,

Mac A. Weaver, P.E.
Chief
UIC State Programs

6W-SU:5/4/93:DELLINGERz:MH:H:\LBAN\WP50\CELANESE\CELANESE.BA\TEST

: ၁၁၄

J. L. Popejoy	-	Without Attached Document
K. Williams	-	"
Mr. Don Squires - Dupont	-	"
Mr. Tom Jones - Golden Strata	-	"
Anne Conely-Pitchell - Bridgewater	-	"
Environmental File No. 203.13		

Page 3



HOECHST CELANESE BAY CITY PLANT
Comments and Notice of Deficiencies
1990, 1991, 1992, and 1993 Pressure Tests
May 3, 1993

1. For all four wells, Celanese should provide a xerox copy of the 1" scaled Induction Log of the Upper Miocene injection interval.
2. Celanese used 0.556 cp as the formation fluid viscosity in the 1993 analysis for WDW-110. A viscosity of 0.71 cp was used for the Upper Miocene Formation in the analysis for the other three wells. Celanese should clarify which viscosity value is correct or use the appropriate value for the viscosity of the Upper Miocene Formation.
3. In the response to Deficiency No. 4 of the March 1, 1993 NOD, Celanese was requested to determine the radius of investigation at the start of radial flow for the 1992 well tests for WDW-32 and WDW-49. In the calculations shown on Attachment 4, Celanese used a delta t of 88.5 hours. Celanese should justify this value. In addition, Celanese was also requested to estimate the waste front radii. Celanese should justify the use of 165 ft as the interval thickness. A review of recent radioactive tracer surveys and the spinner results from WDW-110 indicates the majority of flow entering the top portion of the Upper Miocene interval.

WDW-110 (Well No. 1-A) February 16-17, 1993 falloff test:

1. The data on the log-log and derivative plot included in Appendix E of the recompletion report submitted for WDW-110 exceed the time scale of the plot. Celanese should submit a delta t vs delta t (hours) plot scaled so that all the test data is included on the plot. The start of radial flow should be identified on the plot. The log-log plot submitted incorporating the use of type curves may be used to support the results of the semilog analysis.
2. No early time data is shown on the log-log plot in Appendix E. Celanese should explain why no pressures were recorded during this interval. Celanese should also note the type of gauge used to measure pressures, when the gauge was last calibrated, and the accuracy of the gauge.
3. Celanese should submit an expanded Horner plot with the radial flow portion identified on the plot.

4. The falloff analysis submitted in Appendix E reported a corrected flow time of 265.5 hours. The daily field operations summary reported in Appendix F reported WDW-110 was closed in at 2:30 pm February 16, 1993 (the day before the falloff test). Celanese should justify the use of 265.5 hours in the analysis.

WDW-14 (Well No. 2) November 29-30, 1992 falloff test:

1. Type curve solutions by themselves are not considered acceptable by the EPA since there is often not a single unique type curve match. However, a type curve match may be used to support the semilog analysis. The type curve provided for WDW-14 is not considered an adequate match of the log-log and derivative curves. Celanese should provide a log-log plot with derivative using a time scale in which Δt can be easily identified. The radial flow period should be illustrated on the log-log and an expanded Horner plot. The semilog straight line included on the semilog plot.
2. In the analysis, Celanese uses a thickness of 210 ft. The December 1, 1992 and October 29, 1991 radioactive tracer surveys show the slug going into the upper perforations with little or no flow entering the fill. Celanese should justify the 210 ft thickness used for calculations or employ a more conservative value of h .

WDW-14 (Well No. 2) October 31, 1990 falloff test:

1. The responses to the September 2, 1992 NOD stated that the pressure dropped to 1584 psi in 13 minutes and became static at 1565 psi after only one hour of shut in. A review of the data in Appendix A.4 of the November, 1990 report submitted in June, 1992 showed an elapsed time of 3.14 hours to reach a pressure of 1584 psi. The pressure data between a Δt of 4.05 to 17.90 hours was omitted. Celanese should verify that all the pressure data were included on the log-log and semilog plots.
2. Celanese should explain the pressure fluctuations observed in the pressure data listed in Appendix A.4 of the November, 1990 report. Several of the pressures recorded after 20 hours into the falloff test exceeded the injection pressure of 1649 psi prior to falloff.
3. The derivative plot included as Figure 4 in the response to the September 2, 1992 NOD does not appear to reach radial flow. Should additional pressure points be obtained, the

log-log and semilog plots should be resubmitted. Celanese should define how the infinite acting period was determined on the expanded Horner plot provided in Figure 1 of the response to the October 27, 1992 NOD.

4. Celanese should justify the injection time used to calculate the Horner time.

WDW-32 (Well No. 3) September 14-16, 1992 falloff test:

1. Celanese should state and justify the injection time interval used to calculate the Horner time of the semilog plot and the Agarwal equivalent time on the log-log plot.

WDW-49 (Well No. 4) September 19-22, 1992 falloff test:

1. The derivative curve included in Attachment 1a in the response to the March 1, 1993 NOD is characteristic of a test dominated by constant pressure. No radial flow portion (flattening of the derivative curve) was observed. Celanese should define how the infinite acting portion of the semilog plot was determined.
2. Celanese should justify the use of a corrected flow time of 8760 hours.

WDW-49 (Well No. 4) October 29-30, 1991 falloff test:

1. The derivative curve included as Figure 6 in the response to the September 2, 1992 NOD, demonstrates a characteristic of a test with a closed boundary. No radial flow portion was observed on the plot. Celanese should define how the infinite acting portion of the semilog plot was determined. The expanded Horner submitted in Figure 2 of the responses to the October 27, 1992 NOD was reported as having a slope of 3.6 psi/cycle.

The following issues should be addressed in future falloff test reports to the EPA.

1. The March 17, 1993 response to Deficiency No. 5 of the March 1, 1993 NOD stated that the 1992 Injection Zone Annual Report was prepared to satisfy the reporting requirements for Injection Well Permits and the document was not prepared to satisfy any of the EPA requirements concerning annual falloff testing. The falloff testing guideline mailed to

all operators in June, 1992 specifically states that reports should be submitted to the EPA within 45 days following the test date. The falloff tests for WDW-32 and WDW-49 were conducted between September 14 and 22, 1992. The EPA must assume since no other report was received that the report dated October 27, 1992 was the falloff report submitted for WDW-32 and WDW-49. Celanese should submit future falloff reports to the EPA within 45 days of the test date.

2. Celanese should annotate the pressure-time data identifying the time injection started or ceased in addition to any operating problems that may generate pressure fluctuations in the test.
3. The start of radial flow should be identified on the log-log with derivative plot, Horner plot, and expanded Horner plot.
4. The log-log and derivative plots should be shown on a delta P vs delta t (hrs) plot in addition to any type curve plots (dimensionless time). The start of radial flow is determined from the log-log and derivative plots. The resulting start of radial flow delta t is used to calculate the corresponding Horner time to determine where the semilog straight line analysis should begin on the Horner plot. The EPA does not always agree with the match between the type curve and actual data and therefore requires a log-log plot with a direct reading time scale.
5. When surface pressures have been used to measure the pressure falloff, the conversion factor used to correlate the surface pressures to bottom hole should be provided. The specific gravity of the fluid used in the calculation should be justified. Celanese should deduct the friction pressure in addition to the pressure due to skin from the final injection pressure to represent the reservoir pressure. Any friction table used should be provided.
6. For future tests in which a radial flow portion is not identified, Celanese should either retest, simulate the pressure response to define the anomalies observed, or run an interference/pulse test between wells demonstrating communication between the wells.
7. The rate history of each well should be provided 48 hours prior to and during each falloff test.
8. The injection time prior to the falloff should be stated for each test. This should represent the time value used to calculate the corresponding Horner time.

9. State the type of gauge used to measure pressures, date calibrated, and accuracy of the gauge.
10. The falloff test pressures and parameters should be compared to the results of the approved no migration petition.

Chemical Group

Hoechst Celanese Corporation
Bay City Plant
PO Box 509
Highway 3057
Bay City, TX 77404-0509

March 18, 1993
IOC-024-93



Mr. Mac A. Weaver, P. E.
Chief
UIC State Programs Section (6W-SU)
United States Environmental Protection Agency
Region 6
1445 Ross Avenue, Suite 1200
Dallas, Texas 75202-2733

Subject: Response To EPA Letter Dated March 1, 1993 Relative To
1992 Bottom Hole Pressure Falloff Tests Conducted On
WDW-14, WDW-32 and WDW-49
Hoechst Celanese Chemical Group, Inc.
Bay City Plant, Bay City, Texas

Dear Mr. Weaver:

Enclosed herewith, in a report format, is our response to the list of deficiencies attached to the above letter. The report, generated by our consultants, Golden Environmental Services, Inc., is provided for your review and approval.

For convenience, the report is separated into seven sections. Each section provides our response and corresponds to the deficiencies in chronological order.

Please contact me by telephone at 409/241-4197 should you have questions and/or comments pertaining to the report.

Very truly yours,

A handwritten signature in dark ink, appearing to read 'I. O. Coleman, Jr.', is written over the typed name.

I. O. Coleman, Jr.

cjs
attachment



cc: Mr. Phil Dellinger
UIC State Programs Section (6W-SU)
U. S. Environmental Protection Agency
Region 6
1445 Ross Avenue, Suite 1200
Dallas, TX 75202-2733

Mr. Joe Kordzi - w/o attachment
UIC State Programs Section (6W-SU)
U. S. Environmental Protection Agency
Region 6
1445 Ross Avenue, Suite 1200
Dallas, TX 75202-2733

Mr. Ben Knape
Geologist
Texas Water Commission
P. O. Box 13087, Capitol Section
Austin, TX 78711-3087



Chemical Group
Hoechst Celanese Corporation
Bay City Plant
PO Box 509
Highway 3057
Bay City, TX 77404-0509

March 12, 1993
IOC-022-93

Mr. Mac A. Weaver, P. E.
Chief
UIC State Program Section (6W-SU)
EPA Region VI
1445 Ross Avenue, Suite 1200
Dallas, Texas 75202-2733



Subject: Response To EPA's Request For Additional Information
Associated With The NO. 2 Notice Of Deficiency Relative
To 1992 Injection Well Falloff Testing Results/Data
[References: (1) Your Letter To Ms. Kaymartha Williams
Dated October 27, 1992 And (2) A December 8, 1992 Meeting
With Mr. Joe Kordzi And Ms. Susie Lopez]

Dear Mr. Weaver:

The enclosed document, generated by our consultants, DuPont Environmental Remediation Services, Inc., and Golden Environmental Services, Inc., is: (1) provided in response to EPA's requests to provide additional Horner plots and a graph of the petition model predicted pressures for the life of the petition exemption and (2) submitted for your review and approval.

Don't hesitate to contact me by telephone at 409/241-4197 if you have any comments or questions regarding the information in the response document.

Very truly yours,


I. O. Coleman, Jr.

cjs
attachment

cc: Mr. Phil Dellinger - w/o attachment
UIC State Programs Section (6W-SU)
U. S. Environmental Protection Agency
Region 6
1445 Ross Avenue, Suite 1200
Dallas, TX 75202-2733

Mr. Joe Kordzi - w/o attachment
UIC State Programs Section (6W-SU)
U. S. Environmental Protection Agency
Region 6
1445 Ross Avenue, Suite 1200
Dallas, TX 75202-2733

Mr. Ben Knape
Geologist
Texas Water Commission
P. O. Box 13087, Capitol Section
Austin, TX 78711-3087

4
3-1-93 SD

CERTIFIED MAIL # P 885 487 994 - RETURN RECEIPT REQUESTED

REPLY TO: 6W-SU

Mr. I.O. Coleman, Jr.
Environmental Affairs Section Leader
Hoechst Celanese Corporation
Bay City Plant
P.O. Box 509
Highway 3057
Bay City, Texas 77404-0509

Dear Mr. Coleman:

The EPA has reviewed the 1992 bottom hole pressure falloff tests submitted for WDW-14, WDW-32, and WDW-49. Attached is a list of deficiencies for the 1992 tests. All deficiencies should be addressed and submitted to EPA's Region 6 office by March 19, 1993.

Also enclosed is another copy of the Pressure Falloff Testing Guideline sent to Celanese, June 17, 1992. Celanese should review the guideline and verify that all pertinent information is included in the falloff reports.

Please contact Phil Dellinger at (214) 655-7142 if you have any questions.

Sincerely yours,

Mac A. Weaver, P.E.
Chief
UIC State Programs Section (6W-SU)

Enclosure

6W-SU:PDELLINGER:X7142:sd:3/1/93:DISK:LBAN:CELANESE:CELANESE:BAY ^{LET.}

PD 3/2/93

mm
3/2/93

HOECHST CELANESE BAY CITY PLANT
Notice of Deficiencies
1992 Annual Pressure Tests
March 1, 1993

1. Celanese ran a falloff test on WDW-32 and WDW-49 during September, 1992. The pressure data was supplied with a log-log plot and MDH plot but no falloff analysis was included in the report. Celanese has submitted a Horner plot and an expanded Horner plot for Well No. WDW-32 in the response to deficiencies for the 1990 and 1991 tests.
 - a) Celanese should analyze the pressure test data and supply EPA with a ΔP vs Δt (hrs), log-log plot with derivative for both wells. A Horner plot and expanded Horner plot should be submitted for WDW-49. The start of radial flow should be identified on all plots. The semilog straight line should be drawn on the semilog plots.
 - b) Celanese should include the injection rates of all wells in the formation tested 48 hours prior to and during the falloff tests. Celanese should report when each well was last stabilized.
2. Celanese conducted an annual mechanical integrity test and falloff test in WDW-14 during November, 1992.
 - a) Celanese submitted a log-log plot with derivative in the report for WDW-14. Celanese should submit an additional ΔP vs Δt (hrs) log-log plot with derivative with the start of radial flow identified.
 - b) Celanese submitted the radioactive tracer survey for Celanese Clear Lake WDW-45 instead of Celanese Bay City WDW-14. Celanese should submit the RAT for WDW-14.
 - c) Celanese should submit the injection rates of all three wells completed in the Upper Miocene 48 hours prior to and during the falloff test. Celanese reported a corrected flow time of 6184 hrs. Celanese should report when the well was last stabilized.
 - d) Celanese should submit a table of pressure and time data acquired from the falloff. The gauge depth and tagged fill depth should also be included.
3. Celanese should justify the parameters used in the analyses of all three wells and compare the results to those of the approved no migration petition.

4. Celanese should determine the waste front radius and the radius of investigation at the time radial flow begins to determine the appropriate viscosity to use in the analysis.
5. Celanese compared modeled and measured shut in pressures for WDW-32 and WDW-49 in Section 2.3 of the 1992 Injection Zone Annual Report. The modeling results shown in Appendix B provide a yearly value of flowing pressure buildup for the three wells completed in the Upper Miocene injection interval. Celanese should compare the modeled flowing pressures to those measured in all three wells. The measured flowing pressures should be corrected for skin and friction if applicable.
6. The location of the 4 monitoring wells listed on the model output should be identified on the pressure isopleth. In addition, the location of the nearest and worse case artificial penetrations should be identified.
7. Celanese determined an average injection rate from 1991 and 1992 to forecast pressure buildup to year 2000. The resulting rates for each well were less than the 1992 rates. Celanese should use the maximum rates used in the petition demonstration to forecast pressure buildup.

4

Chemical Group
Hoechst Celanese Corporation
Bay City Plant
PO Box 509
Highway 3057
Bay City, TX 77404-0509

January 7, 1993
IOC-004-93

68 JAN 11 1993 11:23
CT-9

Mr. Richard E. Merritt,
Permit Coordinator
Underground Injection Control Team Permits Section
Office Of Waste Management and Pollution Cleanup
Texas Water Commission
P. O. Box 13087
1700 North Congress Avenue
Austin, Texas 78711-2087

Subject: Annual (1992) Mechanical Integrity Testing (MIT) Report
Class I Injection Well, WDW-14
Hoechst Celanese Chemical Group, Inc.,
Bay City Plant, Bay City, Texas
(Reference Letter, HRH-9-93, Dated January 7, 1993 Attached
as Addendum I)

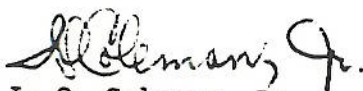
Dear Mr. Merritt:

Enclosed herewith is a copy of the final MIT report on WDW-14 for your review and approval.

As you are aware: (1) the MIT of the well was performed by Golden Environmental Services, Inc. (GES), on December 1 and 2, 1992, (2) the final MIT report was prepared by GES and (3) WDW-14 demonstrated mechanical integrity as required by Texas Water Commission Underground Control Program and 31 TAC, Sections, 331.4 and 331.43.

Please don't hesitate to contact Mr. H. R. Horton at 409/241-4076 or me at 409/241-4197 if you have any questions concerning the report.

Very truly yours,


I. O. Coleman, Jr.

cc: Mr. Phillip B. Dellinger
UIC Program Section 6W-SU
Water Supply Branch
Environmental Protection Agency
Region VI
1445 Ross Avenue, Suite 1200
Dallas, Texas 75202-2733

Mr. Ben K. Knappe
Underground Control Section
Texas Water Commission
P. O. Box 13087
1700 North Congress Ave.
Austin, Texas 78711-3087
(Without Enclosures)

Date: January 7, 1993

HRH-9-93

To: As Listed

From: H. R. Horton

Dept/Location:

Dept/Location: Maintenance Engineering

Subject: Mechanical Integrity Test Report

I. O. Coleman
J. L. Popejoy
E. H. Chiu → R. E. Bennett

pc: W. G. Cornman - Without Attachment
R. S. O'Neal - Without Attachment

File: 11.13.0.01 - With Attachment

Mechanical integrity tests were conducted on neutral waste injection well, WDW-14 (#2) on December 1 and 2, 1992.

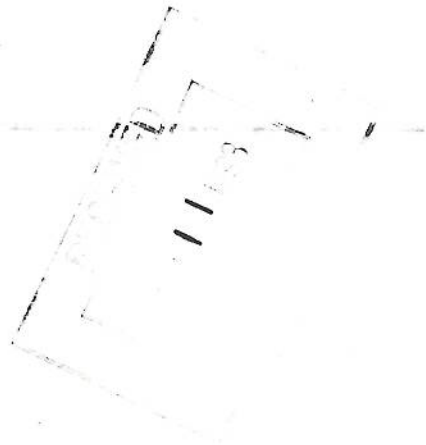
The State of Texas requires all Class I waste disposal wells to demonstrate mechanical integrity on a yearly basis as outlined in 31 TAC § 331.43. These tests are performed to demonstrate that no significant leaks exist in the casing, tubing or packer and that no significant fluid movement into any underground source of drinking water can occur.

Well WDW-14 (#2) is considered to be mechanically sound and in good condition at this time and suitable for use as a Class I waste injection well.

Attached is the complete report of test as submitted by Golden Strata Services, Inc.


H. R. Horton

dls
attachment



MA
Phil

November 23, 1992
IOC-119-92

Chemical Group
Hoechst Celanese Corporation
Bay City Plant
PO Box 509
Highway 3057
Bay City, TX 77404-0509

Mr. Mac A Weaver, P. E.
Chief
UIC State Program Section (6W-SU)
EPA Region VI
1445 Ross Avenue
Suite 1200
Dallas, Texas 75202-2733

Subject: Response To An EPA Letter Dated September 2, 1992 Delineating
Notice Of Deficiencies On 1990 And 1991 Falloff Testing Results
Associated With Hoechst Celanese Chemical Group, Inc., Bay City
Plant Injection Wells
References: (1) Your Letter Dated October 27, 1992 And
(2) Ms. Kaymartha Williams' Letter, KW-217-92, Dated
November 6, 1992

Dear Mr. Weaver:

The attached document, generated by our consultants, DuPont Environmental Remediation Services, Inc., is: (1) our response to the Notice Of Deficiency (NOD) letter (reference above) regarding the 1990 and 1991 falloff testing results associated with our Class I injection wells and (2) submitted for your review and approval.

Per information in the response document, we believe: (1) the injection wells are operating in a safe manner and (2) the wells' operational parameters are consistent with our approved "No-Migration Injection Well Petition".

Your consideration of our request to review and approve our response to the NOD letters is appreciated.

Please contact Ms. Kaymartha Williams at (409) 241-4123 or me at (409) 241-4197 if there are any questions concerning the information in the response document.

Very truly yours,

I. O. Coleman, Jr.
I. O. Coleman, Jr.



8-119
92 DEC - 1 PM 12:20

cc: Mr. Phil Dellinger
UIC State Programs Section (6W-SU)
U.S. Environmental Protection Agency
Region 6
1445 Ross Avenue, Suite 1200
Dallas, TX 75202-2733

Mr. Joe Kordzi
UIC State Programs Section (6W-SU)
U.S. Environmental Protection Agency
Region 6
1445 Ross Avenue, Suite 1200
Dallas, TX 75202-2733

Mr. Ben Knappe
Geologist
Texas Water Commission
P.O. Box 13087, Capital Section
Austin, TX 78711-3087



bcc: With Attached Document

K. Williams
Environmental File No. 206.1G
Environmental File No. 203.13

Without Attached Document

C. R. Pennington
H. P. Heathman
W. G. Cornman
N. C. Stafford
B. L. Fritz
R. S. O'Neal
G. J. McCarthy
K. A. Kouri
Mr. Don Squyers-Dupont
Mr. Bob Hall-Golden Strata
Mr. Tom Jones-Golden Strata





Hoechst Celanese

(4)

6W-5
page 137
Rowett (H)

HOECHST CELANESE CHEMICAL COMPANY

P.O. BOX 509, BAY CITY, TEXAS 77414

409 - 245 - 4871

FAX TRANSMITTAL

RECEIVED
WATER MANAGEMENT
92 NOV 19 AM 9:41
6W-EA

DATE: November 19, 1992

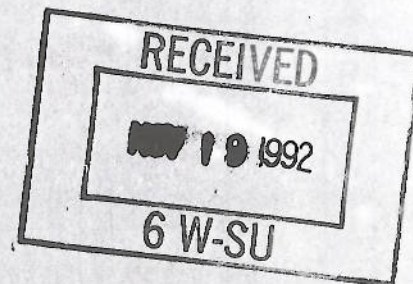
TIME: 8:30 AM / PM

TO: Joe Korz

COMPANY: Environmental Protection Agency - Dallas, Texas

DEPT: UIC Permit Section

FROM: Keymartha Williams



3 **PAGES (INCLUDING COVER)**

If transmission is interrupted or of poor quality, please notify sender immediately, 409-241-4087

Our FAX number is 409-241-4086

Hoechst

Hoechst Celanese Chemical Group, Inc.
Bay City Plant, Bay City, Texas
Injection Well Volumes (Gallons)

YEAR	NDM-8(ND. 1)	NDM-14(ND. 2)	NDM-32(ND. 3)	NDM-49(ND. 4)	NDM-110(ND. 1A)
1964	14,932,800	0	0	0	0
1965	81,700,000	51,700,000	0	0	0
1966	95,400,000	95,400,000	0	0	0
1967	130,900,000	121,900,000	51,000,000	0	0
1968	148,600,000	170,143,000	94,185,000	0	0
1969	152,900,000	181,000,000	85,600,000	51,200,000	0
1970	151,333,000	136,018,000	144,910,000	153,121,000	0
1971	157,068,000	99,164,720	99,591,840	103,453,920	0
1972	157,638,560	81,656,640	85,053,600	91,293,120	0
1973	14,843,520	78,708,960	112,011,840	124,671,840	41,541,120
1974	0	61,452,529	79,847,526	99,178,652	148,359,080
1975	0	59,912,560	65,005,776	90,296,424	114,675,264
1976	0	57,535,200	92,311,200	115,643,760	121,730,880
1977	0	75,935,560	94,078,180	113,813,280	131,012,640
1978	0	79,655,040	81,007,200	136,696,320	132,156,080
1979	0	115,836,480	108,322,560	121,121,280	173,524,320
1980	0	126,914,400	67,021,920	92,155,680	142,744,320
1981	0	93,955,680	72,112,320	63,895,680	34,728,960
1982	0	62,120,160	63,470,880	55,572,480	78,488,640

NOV 19 1992

6 W-SU

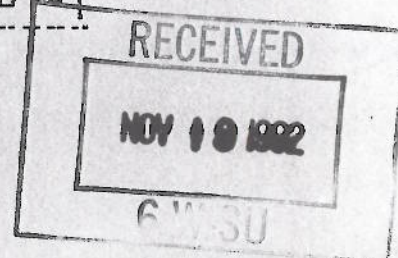
RECEIVED

Hoechst Celanese Chemical Group, Inc.
Bay City Plant, Bay City, Texas
Injection Well Volumes (Gallons)

YEAR	MDN-6(ND.1)	MDN-14(ND.2)	MDN-32(ND.3)	MDN-49(ND.4)	MDN-110(ND.10)
1983	0	39,181,760	50,875,200	51,962,324	81,384,480
1984	0	34,912,440	49,909,760	50,427,360	53,735,880
1985	0	57,803,040	53,062,560	55,402,560	56,823,840
1986	0	56,307,660	39,581,280	34,165,540	89,974,080
1987	0	41,011,200	41,626,080	41,215,680	110,021,760
1988	0	45,616,320	39,124,800	37,116,000	101,702,880
1989	0	36,887,040	34,760,160	32,346,880	75,382,520
1990	0	42,357,500	35,235,400	35,762,500	89,273,400
1991	0	50,696,000	38,799,700	35,411,200	76,089,800
1992	0	26,656,000	43,464,000	45,563,000	0
TOTAL	1,105,215,880	2,385,745,568	1,856,550,062	1,859,652,020	2,016,379,024

- NOTE: 1. Hazardous Waste include K009(Distillation bottoms from Acetaldehyde production from ethylene).
2. Hazardous Waste include K010(Distillation side-cuts from Acetaldehyde production from ethylene).
3. 1992 totals are for the months of January, 1992 to October, 1992.

break down



50
1
OCT 28 1992

OCT 28 1992

CERTIFIED MAIL P 399 862 228 RETURN RECEIPT REQUESTED

Ms. Kaymartha Williams
Hoechst Celanese Corporation
Bay City Plant
P.O. Box 509
Highway 3057
Bay City, TX 77404-0509

Dear Ms. Williams:

The EPA has reviewed the responses to the September 2, 1992 Notice of Deficiencies on the falloff tests for the Celanese Bay City injection wells. These responses are not considered to be adequate. One of the primary reasons for running the falloff tests is to compare existing bottomhole pressures with those predicted by the computer model in the petition to insure that the maximum predicted pressure is not exceeded. The September 2, 1992 deficiencies requested Celanese to compare flowing reservoir pressure with that determined in the approved petition demonstration. Celanese has not provided this response. Celanese should specifically address the attached deficiencies by November 9, 1992 or notify the EPA as to the reasons why this deadline cannot be met.

Please contact Phil Dellinger or Joe Kordzi at (214) 655-7160 if you have any questions.

Sincerely,

Mac A. Weaver, P.E.
Chief
UIC State Programs Section

cc: Ben Knape, TWC

6WUS:10/27/92:DELLINGER:MH:H\LBAN\WP50\CELANESE\CELANESE.BA\
BAYCTY2.YES

6W-SU 6W-SU
KORDZI WEAVER

for PD 10/28/92
10/28/92

HOECHST CELANESE BAY CITY PLANT
Notice of Deficiencies No. 2
1990 and 1991 Annual Pressure Tests
October 27, 1992

1. Celanese should provide an expanded Horner plot for WDW-14 and WDW-49. The semilog straight line should be included on the plot.
2. Celanese states that due to the model used in the petition demonstration and limited output, a fair comparison between actual and predicted pressures is not possible. Celanese should compare the flowing reservoir pressure less ΔP due to skin with the maximum pressure buildup predicted at the end of the operational period. Celanese should also compare the calculated transmissivity and permeability with that used in the petition. EPA suggests Celanese to refer to Section 2 of their approved petition for data input into the model. If Celanese is unable to compare data then a new pressure buildup model should be run in which pressures, transmissivity and permeability can be checked.
3. Celanese was requested to include the injection rates of the wells in the same formation prior to and during the falloff test of WDW-49.

4

Hoechst Celanese

Chemical Group
Hoechst Celanese Corporation
Bay City Plant
PO Box 509
Highway 3057
Bay City, TX 77404-0509

October 1, 1992
KW-162-92

Mr. Mac A. Weaver, P.E.
Chief - UIC State Programs Section (6W-SU)
U.S. Environmental Protection Agency
Region 6
1445 Ross Avenue, Suite 1200
Dallas, Texas 75202-2733

Re: Hoechst Celanese Chemical Group, Inc.
Bay City Plant, Bay City, Texas
Response to USEPA Letter Dated September 2, 1992

Dear Mr. Weaver:

This letter is in response to your letter dated September 2, 1992 letter (Addendum I), concerning the requirements of Petition Condition No. 8 (Annual Pressure Tests) for the years 1990 and 1991. The bottom hole pressure analysis (Addendum II) was prepared by Golden Environmental Services and addresses those deficiencies outlined in the above referenced letter.

If you need any additional information, please do not hesitate to telephone me at (409)241-4123 or Mr. I. O. Coleman, Jr. at (409)241-4197.

Sincerely yours,



Kaymartha Williams
Environmental Engineer

Attach.

cc: Mr. Ben Knape
Geologist
Texas Water Commission
P.O. Box 13087, Capitol Section
Austin, Texas 78711-3087



bcc: C. R. Pennington - w/o attachments
H. P. Heathman - " "
I. O. Coleman, Jr. - " "
G. J. McCarthy - " "
K. A. Kouri - w/o attachments
Environmental File No. 206.1F
Environmental File No. 203.15 - w/o attachments



ADDENDUM I





UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION 6
1445 ROSS AVENUE, SUITE 1200
DALLAS, TX 75202-2733

September 2, 1992

Ms. Kaymartha Williams
Hoechst Celanese Corporation
Bay City Plant
P.O. Box 509
Highway 3057
Bay City, Texas 77404-0509

Dear Ms. Williams:

The EPA has reviewed the 1990 and 1991 bottom hole pressure falloff tests submitted June 29, 1992. Celanese is required in **Petition Condition No. 8** to provide a falloff test for each of its four wells. However, Celanese notified the EPA that WDW-110 was plugged and temporarily abandoned after losing its injectivity prior to the 1991 falloff test for this well. Celanese submitted only one test for the remaining three wells (WDW-14, WDW-32, and WDW-49) which are all completed in the 3350 to 3600 injection interval. However, no data were submitted to demonstrate that WDW-14, WDW-32 and WDW-49 are in communication and that a single well test would satisfy the requirements of Condition No. 8. Future well tests should be conducted for each well or an interference test demonstrating the wells are in communication should be performed to show that a single falloff test is representative for all three wells.

Attached is a list of deficiencies for the 1990 and 1991 well tests. All deficiencies should be addressed and submitted to EPA's Region 6 office by October 2, 1992.

If you have any questions, please contact Phil Dellinger or Joe Kordzi at (214) 655-7160.

Sincerely yours,

A handwritten signature in cursive script that reads "Mac A. Weaver".

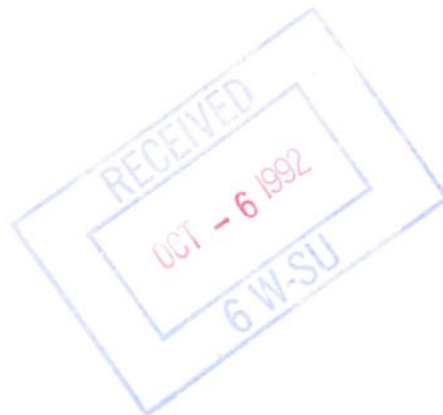
Mac A. Weaver, P.E.
Chief
UIC State Programs Section (6W-SU)

cc: Ben Knape, Texas Water Commission



HOECHST CELANESE BAY CITY PLANT
Notice of Deficiencies
1990 and 1991 Annual Pressure Tests
September 2, 1992

1. Celanese ran a falloff test on WDW-14 and WDW-110 during October, 1990. The pressure data was supplied but no falloff analysis or comparison of reservoir parameters with the approved petition demonstration were included in the reports. Celanese is requested to review the EPA Region 6 guidelines for falloff testing dated June 17, 1992 and submit the following for each test:
 - a) Celanese should analyze the pressure test data and supply EPA with a log-log plot with derivative, Horner plot, and expanded Horner plot. The end of wellbore storage should be identified. The semilog straight line should be drawn on both semilog plots.
 - b) Celanese should include the injection rates of all wells in the formation tested 48 hours prior to and during the falloff test of WDW-14.
 - c) Celanese should justify the parameters used in the analysis and show all calculations.
 - d) Celanese should compare the flowing reservoir pressure, transmissivity, and permeability with those used in the approved petition demonstration.
2. Celanese conducted a falloff test on WDW-49 during October, 1991. Celanese submitted the pressure data and two plots for the well test. Celanese should submit similar data requested above for this WDW-49 falloff test.



file
Chemical Group
Hoechst Celanese Corporation
Bay City Plant
PO Box 509
Highway 3057
Bay City TX 77404-0509

September 1, 1992
IOC-72-92

Mr. Richard E. Merritt, Permit Coordinator
Underground Injection Control Team Permits Section
Industrial and Hazardous Waste Division
Office of Waste Management and Pollution Cleanup
Texas Water Commission
P. O. Box 13087
1700 North Congress Avenue
Austin, Texas 78711-3087

Subject: Annual (1992) Mechanical Integrity Testing
Of Class I Injection Well, WDW-14
Hoechst Celanese Chemical Group, Inc.
Bay City Plant, Bay City, Texas
(Reference Kaymartha Williams' Letter, KW-128-92.
Dated August 7, 1992, Attached As Addendum I)

Dear Mr. Merritt:

Due to Acetaldehyde market demands through December, 1992, the Bay City Plant would like to delay shutting down its Acetaldehyde production unit to perform Mechanical Integrity Testing (MIT) on WDW-14 which was tentatively scheduled for September 20, 1992 per the subject reference letter.

As you are aware, due to the temporary abandonment status of WDW-110, we are currently disposing the process waste water resulting from Acetaldehyde production via Injection Well, WDW-14. Also, the annual (1991) MIT was performed on this well on October 29th. We therefore, request a sixty-day extension from the October 29, 1992 anniversary date to perform the annual (1992) MIT on WDW-14. This would allow for uninterrupted Acetaldehyde production through mid to late December, 1992 to meet market demands.

We proposed to perform MIT on WDW-14 on or about December 29th. Per our "No-Migration" petition, pressure falloff and bottom hole pressure tests are required to be performed on an annual bases within twelve months of the petition's anniversary date. Since our petition's anniversary date is May 4th each year, granting this request still provides us with the opportunity to perform the annual MIT as well as the pressure falloff and bottom hole pressure tests within the required time frame.

Your earliest reply to this request is appreciated. I can be contacted by telephone at (409) 241-4197 if you have any questions pertaining to this request.

Very truly yours,
I. O. Coleman, Jr.
I. O. Coleman, Jr.
IOC/rm

cc: Mr. Ben K. Knape
Underground Control Section
Texas Water Commission
P. O. Box 13087
1700 North Congress Avenue
Austin, Texas 78711-3087

Mr. Phillip B. Dellinger
UIC Program Section 6W-SU
Water Supply Branch
Environmental Protection Agency
Region VI
1445 Ross Avenue, Suite 1200
Dallas, Texas 75202-2733

ADDENDUM I

Chemical Group
Hoechst Celanese Corporation
Bay City Plant
PO Box 509
Highway 3057
Bay City TX 77404-0509

August 7, 1992
KW-128-92

Mr. Richard Merritt, Geologist
Underground Injection Control Section
Texas Water Commission
1700 North Congress Avenue
Austin, Texas 77811-3087

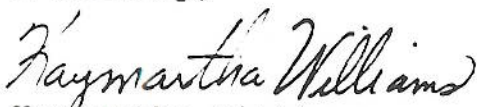
Subject: Mechanical Integrity Testing (MIT) of
Wells WDW-14, -32, and -49
Hoechst Celanese Chemical Group, Inc.
Bay City Plant, Bay City, Texas
Facility Registration Number 30134

Dear Mr. Merritt:

The Hoechst Celanese Chemical Group, Inc. Bay City Plant request approval to demonstrate the mechanical integrity of waste injection wells numbered WDW-14, -32, and -49, per the attached letter (HRH-462-92, July 30, 1992). The MIT is tentatively scheduled for September 16, 1992 thru September 20, 1992.

If you have questions concerning this document and the attachment, please contact me. My telephone number is (409)241-4123.

Sincerely,



Kaymartha Williams
Environmental Engineer

Attachment

cc: Mr. Ben Knape
Underground Injection Control Section
Texas Water Commission
1700 North Congress Avenue
Austin, Texas 77811-3087

Ms. Susan Bredehoest, Manager
Hazardous/Solid Waste Division
Texas Water Commission - District 7
5144 E. Sam Houston Parkway North
Houston, Texas 77015

bcc:C. R. Pennington
H. P. Heathman
B. L. Fritz
W. G. Cornman
G. E. Organ
N. C. Stafford
I. O. Coleman, Jr.
E. H. Chiu
H. R. Horton - w/o attachment
G. J. McCarthy
C. J. Schaefer - Dallas
G. M. Rowen - Bridgewater

Interoffice Memo

Hoechst Celanese

Date July 30, 1992

HRH-462-92

To I. O. Coleman

From H. R. Horton

Dept/Location Lab

Dept/Location Maintenance Engineering

Subject Mechanical Integrity Testing (MIT),
WDW-14, 32, and 49

Section Work Plan
I. A.

pc: W. G. Cornman	E. H. Chiu	R. Allsup - Clear Lake
R. S. O'Neal	E. A. Wilson	C. Gross - Bishop
N. C. Stafford	R. E. Bennett	L. T. Johnston - Pampa
H. P. Heathman	G. E. Organ	D. Horn - Edmonton
G. J. McCarthy	B. L. Fritz	A. Rakhe - HCCGTC
B. A. Logue		
R. M. Hall - Golden Strata Services, Inc.		

Please request and secure approval from the Texas Water Commission to demonstrate mechanical integrity on our waste injection wells, WDW Nos. 14, 32, and 49.

Annulus pressure test (APT) will be conducted on WDW-14 at 800 psig ΔP for 60 minutes and WDW-32 and 49 at 1000 psig ΔP for 30 minutes.

A pressure falloff/bottomhole pressure test (BHP) will be conducted on WDW-32. There will be no BHP performed on WDW-14 and WDW-49 because they are in the same upper Miocene injection sand as WDW-32. All three wells are in pressure communication and one pressure test will be representative of all three.

The mechanical integrity test for WDW-Nos. 32 and 49 are tentatively scheduled for September 16 and 17, 1992 and for WDW-14 on September 20, 1992.

Attached is the complete proposed procedures to demonstrate mechanical integrity testing as submitted by Golden Strata Services, Inc.



H. R. Horton

lrk
attachments

PROPOSED PROCEDURES TO DEMONSTRATE
MECHANICAL INTEGRITY TESTING
HOECHST CELANESE - CHEMICAL GROUP
WDW-14
BAY CITY FACILITY

The following step-by-step proposed mechanical integrity testing (MIT) procedures were developed in accordance with the Underground Injection Control (UIC) and the Hazardous Waste Disposal Injection Restrictions (HWDIR) Programs issued by the United States Environmental Protection Agency (US EPA) and promulgated by the Texas Water Commission (TWC). Except where noted, all steps of this procedure will be performed by Golden Environmental Services' (GES) personnel.

- 1) **Request and secure approval from the TWC to demonstrate MIT (HCCG & GES).**
 - * Define annulus pressure test, type logging tools and downhole logging procedures and submit to HCCG .
 - * HCCG will draft a letter which will provide formal notification to the TWC of the intent to demonstrate MIT.
 - * HCCG will issue the letter to the TWC for review and acceptance.
 - * Receive approval letter from TWC on proposed MIT.
- 2) **Notify the TWC field inspector of the scheduled MIT (HCCG).**
 - * Verbally notify the field inspector of the date field work is scheduled and the estimated starting time for the first test to be witnessed by the TWC.
 - * Determine the intent of TWC to field witness MIT.
 - * Determine desire of TWC for any special documentation of test results.
- 3) **Prepare well for MIT (HCCG).**
 - * Test master valve to make sure that it will open, close and seal off properly.
 - * Check wellhead valves to insure that standard fittings can be installed during the MIT. GES requests that a 2" NPT connection, or standard oil field size adapter, be available on the tubing and casing outlets.
 - * HCCG's personnel will be set-up to maintain proper annulus pressure while conducting the radioactive tracer (RAT) survey.
 - * Close well in 24 hours prior to performing annulus pressure test.



4) **Perform annulus pressure test.**

- * Install calibrated pressure gauge onto the annulus. Also, HCCG will furnish and install a pressure recorder.
- * HCCG's personnel will slowly pressurize the annulus using nitrogen gas to ± 800 psig. The annulus is reportedly filled with inhibited brine.
- * Monitor casing pressure for a minimum period of 60 minutes. Maximum allowable pressure leak-off rate during test is 5% of maximum test pressure.
- * Gradually bleed off annulus pressure to normal operating level.

5) **Run radioactive tracer (RAT) survey.**

- * Rig up electrical wireline service unit including a gamma ray (G/R) detector, casing collar locator (CCL) and radioactive tracer (RAT) ejector tool. Ejector contains ± 5 millicuries of Iodine 131 radioactive (R/A) solution.
- * Run initial base G/R log from just below perforated section up to $\pm 300'$ above the packer (@3162'), or up to $\pm 2800'$. Make repeat G/R run in cased section to prove G/R tool repeatability.
- * Run one (1) five-minute statistical log at a depth of 3150'.
- * Commence pumping effluent fluid down tubing using HCCG's injection pumps at a steady rate.
- * Release first R/A slug inside tubing at $\pm 2800'$ while pumping fluid down the tubing at the rate of ± 40 gpm. Note: This injection rate will be used on all wells. Make multiple recorded passes following the R/A slug (1) down the tubing, (2) into the borehole and (3) into the disposal zone until the R/A slug virtually disappears and cannot be distinguished from the normal background G/R radioactivity.
- * Release second R/A slug from tool at $\pm 2800'$ and run tool to $\pm 3150'$. Hold tool stationary. Place recorder on time-drive sequence. Logging time will be predetermined based on actual injection rate and as agreed upon with the TWC inspector.
- * Run final base G/R from just below base of perforated section up to $\pm 2800'$ (same interval as original base G/R log) to verify that all R/A materials have been flushed into the disposal zone and that no fluid is migrating up behind the casing strings. Pull tool out of the hole.



6) **MIT field work is completed.**

- * Rig down all rental equipment and either move to the next injection well or off the location.
- * Advise TWC of test results and that each injection well is, or is not, ready to resume injection service. If MIT fails, submit a workover procedure to the TWC. Note: The latter work is not included in the scope of this project.

7) **Submit MIT report (HCCG & GES).**

- * Prepare a draft MIT report detailing the demonstration of MIT on WDW No. 14.
- * Submit draft report to HCCG for comments and approval (GES).
- * GES will correct the MIT report as required and issue 5 copies of the final report to HCCG.
- * HCCG will submit report to the TWC for review and approval.
- * HCCG will receive TWC's acceptance of the MIT report.

8) **Mechanical Integrity Testing Complete.**



PROPOSED PROCEDURES TO DEMONSTRATE
MECHANICAL INTEGRITY TESTING
HOECHST CELANESE - CHEMICAL GROUP
WDW-32
BAY CITY FACILITY

The following step-by-step proposed mechanical integrity testing (MIT) procedures were developed in accordance with the Underground Injection Control (UIC) and the Hazardous Waste Disposal Injection Restrictions (HWDIR) Programs issued by the United States Environmental Protection Agency (US EPA) and promulgated by the Texas Water Commission (TWC). Except where noted, all steps of this procedure will be performed by Golden Environmental Services' (GES) personnel.

- 1) **Request and secure approval from the TWC to demonstrate MIT (HCCG & GES).**
 - * Define annulus pressure test, type logging tools and downhole logging procedures and submit to HCCG.
 - * HCCG will draft a letter which will provide formal notification to the TWC of the intent to demonstrate MIT.
 - * HCCG will issue the letter to the TWC for review and acceptance.
 - * Receive approval letter from TWC on proposed MIT.
- 2) **Notify the TWC field inspector of the scheduled MIT (HCCG).**
 - * Verbally notify the field inspector of the date field work is scheduled and estimated starting time for the first test to be witnessed by the TWC.
 - * Determine the intent of TWC to field witness MIT.
 - * Determine desire of TWC for any special documentation of test results.
- 3) **Prepare well for MIT (HCCG).**
 - * Test master valve to make sure that it will open, close and seal off properly.
 - * Since a bottom hole pressure (BHP) bomb will be run while injecting process fluid into the well, a full-opening valve (minimum 2" inside diameter) should be installed on top of the wellhead above the inlet effluent flowline prior to starting MIT.
 - * Check wellhead valves to insure that standard fittings can be installed during the MIT. GES requests that a 2" NPT connection, or standard oil field size adapter, be available on the tubing and casing outlets.



- * HCCG's personnel will be set-up to maintain proper annulus pressure while conducting the radioactive tracer (RAT) survey.
- 4) **Perform pressure fall-off and static bottom hole pressure (BHP) survey with SPIDR.**
- * Inject neutral process fluid into well at stable low rates for a minimum of two days prior to performing falloff test.
 - * Install SPIDR surface pressure gauges on WDW-32.
 - * Maintain constant injection rates a minimum of two hours prior to shutting well in.
 - * Shut-in well. Leave well shut-in for +/- 24 hours to obtain pressure decay data. Data obtained at the end of this test will provide static BHP.
- 5) **Perform annulus pressure test.**
- * Install calibrated pressure gauge onto the annulus. HCCG will furnish and install a pressure recorder.
 - * HCCG's personnel will slowly pressurize the annulus using nitrogen gas to +/-1,000 psig. The annulus is filled with inhibited brine.
 - * Monitor casing pressure for a minimum period of 30 minutes. Maximum allowable pressure leak-off rate during test is 5% of maximum test pressure.
 - * Gradually bleed off annulus pressure to normal operating level.
- 6) **Run radioactive tracer (RAT) survey.**
- * Rig up electrical wireline service unit including a gamma ray (G/R) detector, casing collar locator (CCL) and radioactive tracer (RAT) ejector tool. Ejector contains +/-5 millicuries of Iodine 131 radioactive (R/A) solution. Install lubricator on top of wellhead.
 - * Run initial base G/R log from base of screen liner section up to +/-300' above the packer (@3192'), or to +/-2900'. Make repeat G/R run in cased section to prove G/R tool repeatability.
 - * Run one (1) five-minute statistical log at a depth of 3225'.
 - * Commence pumping effluent fluid down tubing using HCCG's injection pumps at a steady rate.



- * Release first R/A slug inside tubing at $\pm 2900'$ while pumping fluid down the tubing at the rate of ± 40 gpm. Make multiple recorded passes following the R/A slug (1) down the tubing, (2) into the borehole and (3) into the disposal zone until the R/A slug virtually disappears and cannot be distinguished from the normal background G/R radioactivity.
- * Release second R/A slug from tool at $\pm 2900'$ and run tool to $\pm 3225'$. Hold tool stationary. Place recorder on time-drive sequence. Logging time will be predetermined based on actual injection rate and as agreed upon with the TWC inspector.
- * Run final base G/R from just below base of screened section up to $\pm 2900'$ (same interval as original base G/R log) to verify that all R/A materials have been flushed into the disposal zone and that no fluid is migrating up behind the casing strings. Pull tool out of the hole.

7) **MIT field work is completed.**

- * Rig down all rental equipment and either move to the next injection well or off the location.
- * Advise TWC of test results and that each injection well is, or is not, ready to resume injection service. If MIT fails, submit a workover procedure to the TWC. Note: The latter work is not included in the scope of this project.

8) **Submit MIT report (HCCG & GES).**

- * Prepare a draft MIT report detailing the demonstration of MIT on WDW No. 32.
- * Submit draft report to HCCG for comments and approval (GES).
- * GES will correct the MIT report as required and issue 5 copies of the final report to HCCG.
- * HCCG will submit report to the TWC for review and approval.
- * HCCG will receive TWC's acceptance of the MIT report.

9) **Mechanical Integrity Testing Complete.**

PROPOSED PROCEDURE TO DEMONSTRATE
MECHANICAL INTEGRITY TESTING
HOECHST CELANESE - CHEMICAL GROUP
WDW-49
BAY CITY FACILITY

The following step-by-step proposed mechanical integrity testing (MIT) procedures were developed in accordance with the Underground Injection Control (UIC) and the Hazardous Waste Disposal Injection Restrictions (HWDIR) Programs issued by the United States Environmental Protection Agency (US EPA) and promulgated by the Texas Water Commission (TWC). Except where noted, all steps of this procedure will be performed by Golden Environmental Services' (GES) personnel.

- 1) **Request and secure approval from the TWC to demonstrate MIT (HCCG & GES).**
 - * Define annulus pressure test, type logging tools and downhole logging procedures and submit to HCCG (GES).
 - * HCCG will draft a letter which will provide formal notification to the TWC of the intent to demonstrate MIT.
 - * HCCG will issue the letter to the TWC for review and acceptance.
 - * Receive approval letter from TWC on proposed MIT.
- 2) **Notify the TWC field inspector of the scheduled MIT (HCCG).**
 - * Verbally notify the field inspector of the date field work is scheduled and the estimated starting time for the first test to be witnessed by the TWC.
 - * Determine the intent of TWC to field witness MIT.
 - * Determine desire of TWC for any special documentation of test results.
- 3) **Prepare well for MIT (HCCG).**
 - * Test master valve to make sure that it will open, close and seal off properly.
 - * Check wellhead valves to insure that standard fittings can be installed during the MIT. GES requests that a 2" NPT connection, or standard oil field size adapter, be available on the tubing and casing outlets.
 - * HCCG's personnel will be set-up to maintain proper annulus pressure while conducting the radioactive tracer (RAT) survey.



4) **Perform annulus pressure test.**

- * Install calibrated pressure gauge onto the annulus. Also, HCCG will furnish and install a pressure recorder.
- * HCCG's personnel will slowly pressurize the annulus using nitrogen gas to $\pm 1,000$ psig. The annulus is reportedly filled with inhibited brine.
- * Monitor casing pressure for a minimum period of 30 minutes. Maximum allowable pressure leak-off rate during test is 5% of maximum test pressure.
- * Gradually bleed off annulus pressure to normal operating level.

5) **Run radioactive tracer (RAT) survey.**

- * Rig up electrical wireline service unit including a gamma ray (G/R) detector, casing collar locator (CCL) and radioactive tracer (RAT) ejector tool. Ejector contains ± 5 millicuries of Iodine 131 radioactive (R/A) solution.
- * Run initial base G/R log from just below perforated (or screen liner) section up to $\pm 300'$ above the packer (@3316'), or up to $\pm 3000'$. Make repeat G/R run in cased section to prove G/R tool repeatability.
- * Run one (1) five-minute statistical log at a depth of 3300'.
- * Release first R/A slug inside tubing at $\pm 3000'$ while pumping fluid down the tubing at the rate of ± 40 gpm. Make multiple recorded passes following the R/A slug (1) down the tubing, (2) into the borehole and (3) into the disposal zone until the R/A slug virtually disappears and cannot be distinguished from the normal background G/R radioactivity.
- * Release second R/A slug from tool at $\pm 3000'$ and run tool to $\pm 3300'$. Hold tool stationary. Place recorder on time-drive sequence. Logging time will be predetermined based on actual injection rate and as agreed upon with the TWC inspector.
- * Run final base G/R from just below base of screened section up to $\pm 3000'$ (same interval as original base G/R log) to verify that all R/A materials have been flushed into the disposal zone and that no fluid is migrating up behind the casing strings. Pull tool out of the hole.

6) **MIT field work is completed.**

- * Rig down all rental equipment and either move to the next injection well or off the location.
- * Advise TWC of test results and that each injection well is, or is not, ready to resume injection service. If MIT fails, submit a workover procedure to the TWC. Note: The latter work is not included in the scope of this project.



7) **Submit MIT report (HCCG & GES).**

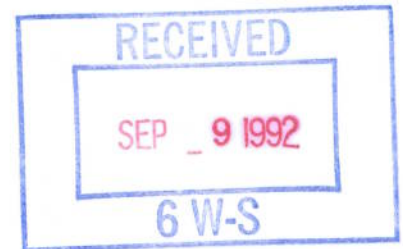
- * Prepare a draft MIT report detailing the demonstration of MIT on WDW-49.
- * Submit draft report to HCCG for comments and approval (GES).
- * GES will correct the MIT report as required and issue 5 copies of the final report to HCCG.
- * HCCG will submit report to the TWC for review and approval.
- * HCCG will receive TWC's acceptance of the MIT report.

8) **Mechanical Integrity Testing Complete.**



file
Chemical Group
Hoechst Celanese Corporation
Bay City Plant
PO Box 509
Highway 3057
Bay City, TX 77404-0509

August 31, 1992
IOC-71-92



Mr. Phillip B. Dillinger
UIC Program Section 6W-SU
Water Supply Branch
Environmental Protection Agency
Region VI
1445 Ross Avenue, Suite 1200
Dallas, Texas 75202-2733

Subject: Annual (1992) Mechanical Integrity Testing
Of WDW - 14, 32 and 49
Hoechst Celanese Chemical Group, Inc.
Bay City Plant, Bay City Texas

Dear Mr. Dellinger,

Per your request during our telephone conversation on today, I have enclosed copies of the following documents for your information and records:

- ATTACHMENT I - Ms. Kaymartha Williams' letter, KW-128-92, dated August 7, 1992 to Mr. Richard Merritt requesting approval of proposed procedures to demonstrate mechanical integrity testing of WDW-14, 32, and 49.
- ATTACHMENT II - Mr. H. R. Horton's letter, HRH-462-92, dated July 30, 1992 with the "Proposed Procedures To Demonstrate Mechanical Integrity Testing Of WDW - 14, 32, and 49" which were generated by our contractor, Golden Environmental Services, Inc.

Please don't hesitate to contact me by telephone at (409) 241-4197 if you have any comments and/or questions concerning the information in the above ATTACHMENTS.

5
409 245-4871
ext. 4197

Very truly yours,

I. O. Coleman, Jr.
I. O. Coleman, Jr.
IOC/rm

cc: Mr. Oscar Cabra - w/o ATTACHMENTS
Water Supply Branch 6W-S
Environmental Protection Agency
Region VI
1445 Ross Avenue, Suite 1200
Dallas, Texas 75202-2733

Mr. Richard E. Merritt, Permit Coordinator - w/o ATTACHMENTS
Underground Injection Control Team Permits Section
Industrial and Hazardous Waste Division
Texas Water Commission
P. O. Box 13087
1700 North Congress Avenue
Austin, Texas 78711-3087

bcc: H. P. Heathman - w/o ATTACHMENTS
K. Williams - " "
G. J. McCarthy - " "
G. M. Rowen - " " , Bridgewater
R. K. Golemon - " " , Austin (File Copy Only)
Environmental File No., 202.14

ATTACHMENT I

Chemical Group
Hoechst Celanese Corporation
Bay City Plant
PO Box 509
Highway 3057
Bay City TX 77404-0509

August 7, 1992
KW-128-92

Mr. Richard Merritt, Geologist
Underground Injection Control Section
Texas Water Commission
1700 North Congress Avenue
Austin, Texas 77811-3087

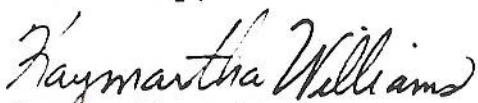
Subject: Mechanical Integrity Testing (MIT) of
Wells WDW-14, -32, and -49
Hoechst Celanese Chemical Group, Inc.
Bay City Plant, Bay City, Texas
Facility Registration Number 30134

Dear Mr. Merritt:

The Hoechst Celanese Chemical Group, Inc. Bay City Plant request approval to demonstrate the mechanical integrity of waste injection wells numbered WDW-14, -32, and -49, per the attached letter (HRH-462-92, July 30, 1992). The MIT is tentatively scheduled for September 16, 1992 thru September 20, 1992.

If you have questions concerning this document and the attachment, please contact me. My telephone number is (409)241-4123.

Sincerely,



Kaymartha Williams
Environmental Engineer

Attachment

cc: Mr. Ben Knappe
Underground Injection Control Section
Texas Water Commission
1700 North Congress Avenue
Austin, Texas 77811-3087

Ms. Susan Bredehoest, Manager
Hazardous/Solid Waste Division
Texas Water Commission - District 7
5144 E. Sam Houston Parkway North
Houston, Texas 77015

bcc:C. R. Pennington
H. P. Heathman
B. L. Fritz
W. G. Cornman
G. E. Organ
N. C. Stafford
I. O. Coleman, Jr.
E. H. Chiu
H. R. Horton - w/o attachment
G. J. McCarthy
C. J. Schaefer - Dallas
G. M. Rowen - Bridgewater

Date July 30, 1992

HRH-462-92

To I. O. Coleman

From H. R. Horton

Dept/Location Lab

Dept/Location Maintenance Engineering

Subject Mechanical Integrity Testing (MIT),
WDW-14, 32, and 49Section Work Plan
I. A.

pc: W. G. Cornman	E. H. Chiu	R. Allsup - Clear Lake
R. S. O'Neal	E. A. Wilson	C. Gross - Bishop
N. C. Stafford	R. E. Bennett	L. T. Johnston - Pampa
H. P. Heathman	G. E. Organ	D. Horn - Edmonton
G. J. McCarthy	B. L. Fritz	A. Rakhe - HCCGTC
B. A. Logue		
R. M. Hall - Golden Strata Services, Inc.		

Please request and secure approval from the Texas Water Commission to demonstrate mechanical integrity on our waste injection wells, WDW Nos. 14, 32, and 49.

Annulus pressure test (APT) will be conducted on WDW-14 at 800 psig ΔP for 60 minutes and WDW-32 and 49 at 1000 psig ΔP for 30 minutes.

A pressure falloff/bottomhole pressure test (BHP) will be conducted on WDW-32. There will be no BHP performed on WDW-14 and WDW-49 because they are in the same upper Miocene injection sand as WDW-32. All three wells are in pressure communication and one pressure test will be representative of all three.

The mechanical integrity test for WDW-Nos. 32 and 49 are tentatively scheduled for September 16 and 17, 1992 and for WDW-14 on September 20, 1992.

Attached is the complete proposed procedures to demonstrate mechanical integrity testing as submitted by Golden Strata Services, Inc.



H. R. Horton

lrk
attachments

PROPOSED PROCEDURES TO DEMONSTRATE
MECHANICAL INTEGRITY TESTING
HOECHST CELANESE - CHEMICAL GROUP
WDW-14
BAY CITY FACILITY

The following step-by-step proposed mechanical integrity testing (MIT) procedures were developed in accordance with the Underground Injection Control (UIC) and the Hazardous Waste Disposal Injection Restrictions (HWDIR) Programs issued by the United States Environmental Protection Agency (US EPA) and promulgated by the Texas Water Commission (TWC). Except where noted, all steps of this procedure will be performed by Golden Environmental Services' (GES) personnel.

- 1) **Request and secure approval from the TWC to demonstrate MIT (HCCG & GES).**
 - * Define annulus pressure test, type logging tools and downhole logging procedures and submit to HCCG.
 - * HCCG will draft a letter which will provide formal notification to the TWC of the intent to demonstrate MIT.
 - * HCCG will issue the letter to the TWC for review and acceptance.
 - * Receive approval letter from TWC on proposed MIT.
- 2) **Notify the TWC field inspector of the scheduled MIT (HCCG).**
 - * Verbally notify the field inspector of the date field work is scheduled and the estimated starting time for the first test to be witnessed by the TWC.
 - * Determine the intent of TWC to field witness MIT.
 - * Determine desire of TWC for any special documentation of test results.
- 3) **Prepare well for MIT (HCCG).**
 - * Test master valve to make sure that it will open, close and seal off properly.
 - * Check wellhead valves to insure that standard fittings can be installed during the MIT. GES requests that a 2" NPT connection, or standard oil field size adapter, be available on the tubing and casing outlets.
 - * HCCG's personnel will be set-up to maintain proper annulus pressure while conducting the radioactive tracer (RAT) survey.
 - * Close well in 24 hours prior to performing annulus pressure test.



4) **Perform annulus pressure test.**

- * Install calibrated pressure gauge onto the annulus. Also, HCCG will furnish and install a pressure recorder.
- * HCCG's personnel will slowly pressurize the annulus using nitrogen gas to ± 800 psig. The annulus is reportedly filled with inhibited brine.
- * Monitor casing pressure for a minimum period of 60 minutes. Maximum allowable pressure leak-off rate during test is 5% of maximum test pressure.
- * Gradually bleed off annulus pressure to normal operating level.

5) **Run radioactive tracer (RAT) survey.**

- * Rig up electrical wireline service unit including a gamma ray (G/R) detector, casing collar locator (CCL) and radioactive tracer (RAT) ejector tool. Ejector contains ± 5 millicuries of Iodine 131 radioactive (R/A) solution.
- * Run initial base G/R log from just below perforated section up to $\pm 300'$ above the packer (@3162'), or up to $\pm 2800'$. Make repeat G/R run in cased section to prove G/R tool repeatability.
- * Run one (1) five-minute statistical log at a depth of 3150'.
- * Commence pumping effluent fluid down tubing using HCCG's injection pumps at a steady rate.
- * Release first R/A slug inside tubing at $\pm 2800'$ while pumping fluid down the tubing at the rate of ± 40 gpm. Note: This injection rate will be used on all wells. Make multiple recorded passes following the R/A slug (1) down the tubing, (2) into the borehole and (3) into the disposal zone until the R/A slug virtually disappears and cannot be distinguished from the normal background G/R radioactivity.
- * Release second R/A slug from tool at $\pm 2800'$ and run tool to $\pm 3150'$. Hold tool stationary. Place recorder on time-drive sequence. Logging time will be predetermined based on actual injection rate and as agreed upon with the TWC inspector.
- * Run final base G/R from just below base of perforated section up to $\pm 2800'$ (same interval as original base G/R log) to verify that all R/A materials have been flushed into the disposal zone and that no fluid is migrating up behind the casing strings. Pull tool out of the hole.



6) **MIT field work is completed.**

- * Rig down all rental equipment and either move to the next injection well or off the location.
- * Advise TWC of test results and that each injection well is, or is not, ready to resume injection service. If MIT fails, submit a workover procedure to the TWC. Note: The latter work is not included in the scope of this project.

7) **Submit MIT report (HCCG & GES).**

- * Prepare a draft MIT report detailing the demonstration of MIT on WDW No. 14.
- * Submit draft report to HCCG for comments and approval (GES).
- * GES will correct the MIT report as required and issue 5 copies of the final report to HCCG.
- * HCCG will submit report to the TWC for review and approval.
- * HCCG will receive TWC's acceptance of the MIT report.

8) **Mechanical Integrity Testing Complete.**



PROPOSED PROCEDURES TO DEMONSTRATE
MECHANICAL INTEGRITY TESTING
HOECHST CELANESE - CHEMICAL GROUP
WDW-32
BAY CITY FACILITY

The following step-by-step proposed mechanical integrity testing (MIT) procedures were developed in accordance with the Underground Injection Control (UIC) and the Hazardous Waste Disposal Injection Restrictions (HWDIR) Programs issued by the United States Environmental Protection Agency (US EPA) and promulgated by the Texas Water Commission (TWC). Except where noted, all steps of this procedure will be performed by Golden Environmental Services' (GES) personnel.

- 1) **Request and secure approval from the TWC to demonstrate MIT (HCCG & GES).**
 - * Define annulus pressure test, type logging tools and downhole logging procedures and submit to HCCG.
 - * HCCG will draft a letter which will provide formal notification to the TWC of the intent to demonstrate MIT.
 - * HCCG will issue the letter to the TWC for review and acceptance.
 - * Receive approval letter from TWC on proposed MIT.
- 2) **Notify the TWC field inspector of the scheduled MIT (HCCG).**
 - * Verbally notify the field inspector of the date field work is scheduled and estimated starting time for the first test to be witnessed by the TWC.
 - * Determine the intent of TWC to field witness MIT.
 - * Determine desire of TWC for any special documentation of test results.
- 3) **Prepare well for MIT (HCCG).**
 - * Test master valve to make sure that it will open, close and seal off properly.
 - * Since a bottom hole pressure (BHP) bomb will be run while injecting process fluid into the well, a full-opening valve (minimum 2" inside diameter) should be installed on top of the wellhead above the inlet effluent flowline prior to starting MIT.
 - * Check wellhead valves to insure that standard fittings can be installed during the MIT. GES requests that a 2" NPT connection, or standard oil field size adapter, be available on the tubing and casing outlets.



- * HCCG's personnel will be set-up to maintain proper annulus pressure while conducting the radioactive tracer (RAT) survey.
- 4) **Perform pressure fall-off and static bottom hole pressure (BHP) survey with SPIDR.**
- * Inject neutral process fluid into well at stable low rates for a minimum of two days prior to performing falloff test.
 - * Install SPIDR surface pressure gauges on WDW-32.
 - * Maintain constant injection rates a minimum of two hours prior to shutting well in.
 - * Shut-in well. Leave well shut-in for +/- 24 hours to obtain pressure decay data. Data obtained at the end of this test will provide static BHP.
- 5) **Perform annulus pressure test.**
- * Install calibrated pressure gauge onto the annulus. HCCG will furnish and install a pressure recorder.
 - * HCCG's personnel will slowly pressurize the annulus using nitrogen gas to +/-1,000 psig. The annulus is filled with inhibited brine.
 - * Monitor casing pressure for a minimum period of 30 minutes. Maximum allowable pressure leak-off rate during test is 5% of maximum test pressure.
 - * Gradually bleed off annulus pressure to normal operating level.
- 6) **Run radioactive tracer (RAT) survey.**
- * Rig up electrical wireline service unit including a gamma ray (G/R) detector, casing collar locator (CCL) and radioactive tracer (RAT) ejector tool. Ejector contains +/-5 millicuries of Iodine 131 radioactive (R/A) solution. Install lubricator on top of wellhead.
 - * Run initial base G/R log from base of screen liner section up to +/-300' above the packer (@3192'), or to +/-2900'. Make repeat G/R run in cased section to prove G/R tool repeatability.
 - * Run one (1) five-minute statistical log at a depth of 3225'.
 - * Commence pumping effluent fluid down tubing using HCCG's injection pumps at a steady rate.



- * Release first R/A slug inside tubing at $\pm 2900'$ while pumping fluid down the tubing at the rate of ± 40 gpm. Make multiple recorded passes following the R/A slug (1) down the tubing, (2) into the borehole and (3) into the disposal zone until the R/A slug virtually disappears and cannot be distinguished from the normal background G/R radioactivity.
- * Release second R/A slug from tool at $\pm 2900'$ and run tool to $\pm 3225'$. Hold tool stationary. Place recorder on time-drive sequence. Logging time will be predetermined based on actual injection rate and as agreed upon with the TWC inspector.
- * Run final base G/R from just below base of screened section up to $\pm 2900'$ (same interval as original base G/R log) to verify that all R/A materials have been flushed into the disposal zone and that no fluid is migrating up behind the casing strings. Pull tool out of the hole.

7) **MIT field work is completed.**

- * Rig down all rental equipment and either move to the next injection well or off the location.
- * Advise TWC of test results and that each injection well is, or is not, ready to resume injection service. If MIT fails, submit a workover procedure to the TWC. Note: The latter work is not included in the scope of this project.

8) **Submit MIT report (HCCG & GES).**

- * Prepare a draft MIT report detailing the demonstration of MIT on WDW No. 32.
- * Submit draft report to HCCG for comments and approval (GES).
- * GES will correct the MIT report as required and issue 5 copies of the final report to HCCG.
- * HCCG will submit report to the TWC for review and approval.
- * HCCG will receive TWC's acceptance of the MIT report.

9) **Mechanical Integrity Testing Complete.**



PROPOSED PROCEDURE TO DEMONSTRATE
MECHANICAL INTEGRITY TESTING
HOECHST CELANESE - CHEMICAL GROUP
WDW-49
BAY CITY FACILITY

The following step-by-step proposed mechanical integrity testing (MIT) procedures were developed in accordance with the Underground Injection Control (UIC) and the Hazardous Waste Disposal Injection Restrictions (HWDIR) Programs issued by the United States Environmental Protection Agency (US EPA) and promulgated by the Texas Water Commission (TWC). Except where noted, all steps of this procedure will be performed by Golden Environmental Services' (GES) personnel.

- 1) **Request and secure approval from the TWC to demonstrate MIT (HCCG & GES).**
 - * Define annulus pressure test, type logging tools and downhole logging procedures and submit to HCCG (GES).
 - * HCCG will draft a letter which will provide formal notification to the TWC of the intent to demonstrate MIT.
 - * HCCG will issue the letter to the TWC for review and acceptance.
 - * Receive approval letter from TWC on proposed MIT.
- 2) **Notify the TWC field inspector of the scheduled MIT (HCCG).**
 - * Verbally notify the field inspector of the date field work is scheduled and the estimated starting time for the first test to be witnessed by the TWC.
 - * Determine the intent of TWC to field witness MIT.
 - * Determine desire of TWC for any special documentation of test results.
- 3) **Prepare well for MIT (HCCG).**
 - * Test master valve to make sure that it will open, close and seal off properly.
 - * Check wellhead valves to insure that standard fittings can be installed during the MIT. GES requests that a 2" NPT connection, or standard oil field size adapter, be available on the tubing and casing outlets.
 - * HCCG's personnel will be set-up to maintain proper annulus pressure while conducting the radioactive tracer (RAT) survey.



4) **Perform annulus pressure test.**

- * Install calibrated pressure gauge onto the annulus. Also, HCCG will furnish and install a pressure recorder.
- * HCCG's personnel will slowly pressurize the annulus using nitrogen gas to $\pm 1,000$ psig. The annulus is reportedly filled with inhibited brine.
- * Monitor casing pressure for a minimum period of 30 minutes. Maximum allowable pressure leak-off rate during test is 5% of maximum test pressure.
- * Gradually bleed off annulus pressure to normal operating level.

5) **Run radioactive tracer (RAT) survey.**

- * Rig up electrical wireline service unit including a gamma ray (G/R) detector, casing collar locator (CCL) and radioactive tracer (RAT) ejector tool. Ejector contains ± 5 millicuries of Iodine 131 radioactive (R/A) solution.
- * Run initial base G/R log from just below perforated (or screen liner) section up to $\pm 300'$ above the packer (@3316'), or up to $\pm 3000'$. Make repeat G/R run in cased section to prove G/R tool repeatability.
- * Run one (1) five-minute statistical log at a depth of 3300'.
- * Release first R/A slug inside tubing at $\pm 3000'$ while pumping fluid down the tubing at the rate of ± 40 gpm. Make multiple recorded passes following the R/A slug (1) down the tubing, (2) into the borehole and (3) into the disposal zone until the R/A slug virtually disappears and cannot be distinguished from the normal background G/R radioactivity.
- * Release second R/A slug from tool at $\pm 3000'$ and run tool to $\pm 3300'$. Hold tool stationary. Place recorder on time-drive sequence. Logging time will be predetermined based on actual injection rate and as agreed upon with the TWC inspector.
- * Run final base G/R from just below base of screened section up to $\pm 3000'$ (same interval as original base G/R log) to verify that all R/A materials have been flushed into the disposal zone and that no fluid is migrating up behind the casing strings. Pull tool out of the hole.

6) **MIT field work is completed.**

- * Rig down all rental equipment and either move to the next injection well or off the location.
- * Advise TWC of test results and that each injection well is, or is not, ready to resume injection service. If MIT fails, submit a workover procedure to the TWC. Note: The latter work is not included in the scope of this project.



7) **Submit MIT report (HCCG & GES).**

- * Prepare a draft MIT report detailing the demonstration of MIT on WDW-49.
- * Submit draft report to HCCG for comments and approval (GES).
- * GES will correct the MIT report as required and issue 5 copies of the final report to HCCG.
- * HCCG will submit report to the TWC for review and approval.
- * HCCG will receive TWC's acceptance of the MIT report.

8) **Mechanical Integrity Testing Complete.**



SEP 2 1992

Ms. Kaymartha Williams
Hoechst Celanese Corporation
Bay City Plant
P.O. Box 509
Highway 3057
Bay City, Texas 77404-0509

Dear Ms. Williams:

The EPA has reviewed the 1990 and 1991 bottom hole pressure falloff tests submitted June 29, 1992. Celanese is required in Petition Condition No. 8 to provide a falloff test for each of its four wells. However, Celanese notified the EPA that WDW-110 was plugged and temporarily abandoned after losing its injectivity prior to the 1991 falloff test for this well. Celanese submitted only one test for the remaining three wells (WDW-14, WDW-32, and WDW-49) which are all completed in the 3350 to 3600 injection interval. However, no data were submitted to demonstrate that WDW-14, WDW-32 and WDW-49 are in communication and that a single well test would satisfy the requirements of Condition No. 8. Future well tests should be conducted for each well or an interference test demonstrating the wells are in communication should be performed to show that a single falloff test is representative for all three wells.

Attached is a list of deficiencies for the 1990 and 1991 well tests. All deficiencies should be addressed and submitted to EPA's Region 6 office by October 2, 1992.

If you have any questions, please contact Phil Dellinger or Joe Kordzi at (214) 655-7160.

Sincerely yours,

Mac A. Weaver, P.E.
Chief
UIC State Programs Section (6W-SU)

cc: Ben Knappe, Texas Water Commission

6W-SU:PDELLINGER:X7160:9/2/92:DISK:LBAN:CELANESE.BA:2BAYCITY.TST

PD 7/2/92 m2
9/2/92

HOECHST CELANESE BAY CITY PLANT
Notice of Deficiencies
1990 and 1991 Annual Pressure Tests
September 2, 1992

1. Celanese ran a falloff test on WDW-14 and WDW-110 during October, 1990. The pressure data was supplied but no falloff analysis or comparison of reservoir parameters with the approved petition demonstration were included in the reports. Celanese is requested to review the EPA Region 6 guidelines for falloff testing dated June 17, 1992 and submit the following for each test:
 - a) Celanese should analyze the pressure test data and supply EPA with a log-log plot with derivative, Horner plot, and expanded Horner plot. The end of wellbore storage should be identified. The semilog straight line should be drawn on both semilog plots.
 - b) Celanese should include the injection rates of all wells in the formation tested 48 hours prior to and during the falloff test of WDW-14.
 - c) Celanese should justify the parameters used in the analysis and show all calculations.
 - d) Celanese should compare the flowing reservoir pressure, transmissivity, and permeability with those used in the approved petition demonstration.
2. Celanese conducted a falloff test on WDW-49 during October, 1991. Celanese submitted the pressure data and two plots for the well test. Celanese should submit similar data requested above for this WDW-49 falloff test.

(4)

Hoechst Celanese

Chemical Group
Hoechst Celanese Corporation
Bay City Plant
PO Box 509
Highway 3057
Bay City, TX 77404-0509
409 245 4871

June 25, 1992
KW-112-92



Mr. Oscar Cabra, Jr., P.E.
Chief - Municipal Facilities (6W-M)
U.S. Environmental Protection Agency
Region 6
1445 Ross Avenue, Suite 1200
Dallas, Texas 75202-2733

Re: Mechanical Integrity Test Reports for Injection Wells WDW-14,
WDW-32, WDW-49, and WDW-110 covering the periods of May 4, 1990
to May 4, 1991 and May 4, 1991 to May 4, 1992
Hoechst Celanese Chemical Group, Inc.
Bay City Plant, Bay City, Texas Registration No. 30134

Dear Mr. Cabra:

This letter is in response to your June 18, 1992 letter (Addendum I) to Mr. I.O. Coleman, Jr. Environmental Section Leader, concerning the falloff test results for Injection Wells WDW-14, WDW-32, WDW-49 and WDW-110 covering the periods of May 4, 1990 to May 4, 1991 and May 4, 1991 to May 4, 1992 per 40 CFR 146.68(e)(1). Enclosed are copies of the mechanical integrity test (MIT) reports for the year 1990 and 1991 (Addendum II-1990 MIT Report and Addendum III-1991 MIT Report), which includes the falloff test results for the above mentioned periods.

If you need any additional information, please do not hesitate to telephone me at (409)241-4123 or Mr. I. O. Coleman, Jr. at (409)241-4197.

Sincerely yours,

Kaymartha Williams
Environmental Engineer

Attach.

ADDENDUM I





UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION 6

1445 ROSS AVENUE, SUITE 1200

DALLAS, TEXAS 75202-2733

June 18, 1992

CERTIFIED MAIL P 176 166 855 RETURN RECEIPT REQUESTED

Mr. I. O. Coleman
Hoechst Celanese Chemical Group, Inc.
P.O. Box 509
Bay City, TX 77404-0509

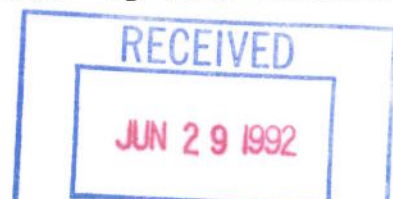
Dear Mr. Coleman:

Our records indicate that Hoechst Celanese Chemical Group, Inc. (Celanese) has not submitted falloff tests for Well Nos. WDW-14, WDW-32, WDW-49, and WDW-110 as required by Condition No. 8 of the December 11, 1991 reissuance approval letter (May 4, 1990 petition approval). Condition No. 8 states:

Hoechst Celanese shall annually submit to EPA the results of bottom hole pressure surveys for WDW-14, WDW-32, WDW-49, WDW-110, and WDW-277 (if drilled). These surveys shall have been performed after shutting in each well for a period of time sufficient to allow the pressure in the injection interval to reach equilibrium, in accordance with 40 CFR 146.68(e)(1). This annual report shall include a comparison of reservoir parameters determined from the falloff tests with parameters used in the approved no migration petition.

According to 40 CFR 146.68(e)(1), Celanese is required to annually monitor the pressure buildup in the injection zone, including at a minimum, a shut down of the well for a time sufficient to conduct a valid observation of the pressure falloff curve.

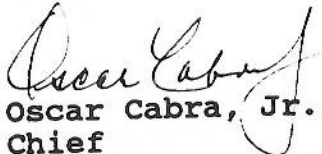
Celanese has not submitted the results of falloff tests for the period May 4, 1990 to May 4, 1991. These tests should have been submitted to the EPA Region 6 office no later than May 4, 1991. In addition, Celanese has not submitted the results of falloff tests for the period May 4, 1991 to May 4, 1992. These tests should have been submitted to the EPA Region 6 office no later than May 4, 1992. As stated in the original petition approval letter mentioned above, "Noncompliance with any of these conditions is grounds for termination of the exemption in accordance with 40 CFR 148.24(a)(1)." Consequently, Celanese has jeopardized its exemption to the land disposal restrictions by not fulfilling Condition No. 8.



Celanese should submit an annual report for Well Nos. WDW-14, WDW-32, WDW-49, and WDW-110 covering the time periods May 4, 1990 to May 4, 1991; and May 4, 1991 to May 4, 1992 by July 17, 1992. These reports should include an analyzable falloff test for each well performed according to the enclosed guideline. If the above deadlines cannot be met, a valid justification should immediately be provided by letter.

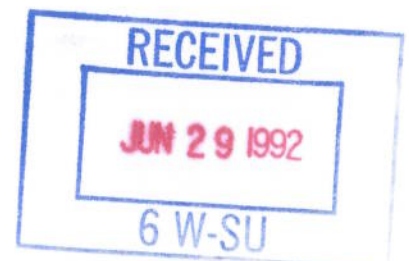
If you have any questions, please contact Phil Dellinger or Joe Kordzi at (214) 655-7160.

Sincerely,



Oscar Cabra, Jr., P.E.
Chief
Municipal Facilities (6W-M)

cc: Ben Knappe



(4)

JUN 18 1992

CERTIFIED MAIL P 176 166 855 RETURN RECEIPT REQUESTED

Mr. I. O. Coleman
Hoechst Celanese Chemical Group, Inc.
P.O. Box 509
Bay City, TX 77404-0509

Dear Mr. Coleman:

Our records indicate that Hoechst Celanese Chemical Group, Inc. (Celanese) has not submitted falloff tests for Well Nos. WDW-14, WDW-32, WDW-49, and WDW-110 as required by Condition No. 8 of the December 11, 1991 reissuance approval letter (May 4, 1990 petition approval). Condition No. 8 states:

Hoechst Celanese shall annually submit to EPA the results of bottom hole pressure surveys for WDW-14, WDW-32, WDW-49, WDW-110, and WDW-277 (if drilled). These surveys shall have been performed after shutting in each well for a period of time sufficient to allow the pressure in the injection interval to reach equilibrium, in accordance with 40 CFR 146.68(e)(1). This annual report shall include a comparison of reservoir parameters determined from the falloff tests with parameters used in the approved no migration petition.

According to 40 CFR 146.68(e)(1), Celanese is required to annually monitor the pressure buildup in the injection zone, including at a minimum, a shut down of the well for a time sufficient to conduct a valid observation of the pressure falloff curve.

Celanese has not submitted the results of falloff tests for the period May 4, 1990 to May 4, 1991. These tests should have been submitted to the EPA Region 6 office no later than May 4, 1991. In addition, Celanese has not submitted the results of falloff tests for the period May 4, 1991 to May 4, 1992. These tests should have been submitted to the EPA Region 6 office no later than May 4, 1992. As stated in the original petition approval letter mentioned above, "Noncompliance with any of these conditions is grounds for termination of the exemption in accordance with 40 CFR 148.24(a)(1)." Consequently, Celanese has jeopardized its exemption to the land disposal restrictions by not fulfilling Condition No. 8.

6W-SU:6/17/92:KORDZI:MH:C:WP50:CELANESE\CELANESE.BA\TESTS.ANL
6W-SU 6W-SU
DELLINGER WEAVER

PD 6/18/92 B. 6/18/92 J. 6/18/92

Celanese should submit an annual report for Well Nos. WDW-14, WDW-32, WDW-49, and WDW-110 covering the time periods May 4, 1990 to May 4, 1991; and May 4, 1991 to May 4, 1992 by July 17, 1992. These reports should include an analyzable falloff test for each well performed according to the enclosed guideline. If the above deadlines cannot be met, a valid justification should immediately be provided by letter.

If you have any questions, please contact Phil Dellinger or Joe Kordzi at (214) 655-7160.

Sincerely,

Oscar Cabra, Jr., P.E.
Chief
Municipal Facilities (6w-M)

cc: Ben Knappe

JUN 17 1992

JUN 17 1992

Mr. I. O. Coleman
Hoechst Celanese Chemical Group, Incorporated
P.O. Box 509
Bay City, Texas 77404-0509

Dear Mr. Coleman:

Enclosed is the final form of the EPA Region 6 Pressure Falloff Testing Guideline. This guideline should be followed in the performance of future falloff testing in fulfillment of the applicable petition condition.

If you have any questions, please contact Joe Kordzi at (214) 655-7160.

Sincerely,

Oscar Cabra, Jr., P.E.
Chief
Municipal Facilities Branch (6W-M)

Enclosures

6W-SU:6/16/92:KORDZI:MH:C:WP50:CELANESE\CELANESE.BA\GUIDELIN.R6

6W-SU
WEAVER

mm
6/16

J.K.
6/16/92

PRESSURE FALLOFF TESTING GUIDELINE
Region 6
May 22, 1992

BACKGROUND

The Hazardous and Solid Waste Amendments of 1984 to the Resource Conservation and Recovery Act mandated prohibitions on the land disposal of hazardous waste. These prohibitions are known as the land disposal restrictions and EPA promulgated regulations to implement these requirements for injection wells on July 26, 1988. The land disposal restrictions for injection wells are codified in 40 CFR Part 148. In addition to specifying the effective dates of the restrictions on injection of specific hazardous wastes, these regulations outline the requirements for obtaining an exemption to the restrictions.

Facilities which have received an exemption to the land disposal restrictions under 40 CFR Part 148 have demonstrated that, to a reasonable degree of certainty, there will be no migration of hazardous constituents from the injection zone for as long as the waste remains hazardous. As part of this approval, facilities are required by Region 6 to meet approval conditions including annual monitoring in accordance to 40 CFR 148.20(d)(2).

Region 6 has adopted the 40 CFR 146.68(e)(1) requirements for monitoring Class 1 hazardous waste disposal wells. Under 40 CFR 146.68(e)(1), operators are required to annually monitor the pressure buildup in the injection zone, including at a minimum, a shut down of the well for a time sufficient to conduct a valid observation of the pressure falloff curve.

PURPOSE OF GUIDELINE

This guideline has been developed by the Region 6 office of the EPA to assist operators in preparing an annual monitoring report. These reports, in most instances, should consist of a falloff test and a comparison of the reservoir parameters derived from the test with those of the petition demonstration. The primary function of this guideline is not to establish boundaries within which enforcement action can be taken. Rather, this guideline is intended to provide direction as to the correct performance of injection well falloff testing. Consequently, the annual report is viewed not as an enforcement tool, but as an annual reaffirmation that the petition demonstration continues to be valid. This guideline may be periodically updated.

ANNUAL PRESSURE TESTING REQUIREMENTS

A falloff test consists of injecting at a constant rate, shutting

in the well, and measuring the pressure falloff. The falloff test should be properly designed so that valid results are obtained. The following points should be kept in mind when planning or conducting a falloff test:

1. The injection rate should be held constant throughout the injection portion of the test. Small, normal fluctuations due to the design of the pump are acceptable. This rate should be at a high enough rate, for a period of time sufficient to produce a pressure buildup, which will result in a valid test. The amount of pressure buildup required will depend largely on the sensitivity of the pressure gauge used, and the specific properties of the formation. The injection rate must result in a pressure buildup such that a semilog straight line can be determined from the Horner plot.
2. Bottom hole pressure measurements are considered superior to surface pressure measurements. However, surface pressure measurements can be employed if it is demonstrated that a positive pressure is maintained at the surface throughout the falloff portion of the test.
3. If surface pressure measurements will be employed and it is anticipated that the injection well will go on vacuum during the test, a two-rate test should be used in order to maintain a positive pressure. Failure to maintain a positive pressure would result in changing wellbore storage effects, making analysis of the test difficult. A relatively high initial rate should be followed by a decreased rate. The pressure decrease as a result of the rate decrease is then analyzed. Choosing the two rates correctly results in a positive surface pressure during the falloff portion of the test and the interpretation problem resulting from changing wellbore effects is thus eliminated.
4. The viscosity and density of the injected fluid should be held as constant as possible throughout the test. Operators are encouraged to use their normal waste streams as injectate, if enough volume will be available so that the guidelines in No. 1, above, concerning the injection rate, can be followed. The value of the viscosity employed in analyzing the test should be that of the fluid through which the pressure transients propagate. Note: This is not necessarily the viscosity of the injected fluid and may be the viscosity of the waste plume or the formation fluid, depending on the size of the waste plume. This is covered in more detail in the mobility ratio discussion.

5. No injection in nearby facility wells should occur in the interval being tested. The pressure buildup in the injection interval due to offset wells should be stabilized prior to testing. Should operational problems prohibit shutting in offset well injection into the interval being tested, a rate near the planned test rates should be maintained prior to and throughout the test. The injection rates and surface pressures of the offset well should be recorded before and during the test period. This, however, does not guarantee good results. Shutting in all injection in communicable zones nearby is the recommended procedure, but EPA realizes that this may not be possible in cases where facilities are located close together and utilize the same injection interval.
6. The depth to any fill in the well tested should be tagged and recorded with the test to assist in the determination of the thickness available to flow.
7. The falloff portion of the injection well test should be run such that enough data points lie well within the infinite acting period and the semilog straight line is well developed.
8. A Horner plot of the data should be submitted with a Miller-Dyes-Hutchinson (MDH) type plot being optional. Additionally, the straight line portion of the Horner plot should be reproduced on an expanded scale in order to permit a closer inspection of any data fluctuations. The semilog straight line should be drawn on the Horner plots.
9. A log-log plot with a semilog derivative should be supplied to enable identification of the end of the wellbore storage period. The end of wellbore storage effects should be identified on both plots.
10. All data including verification of the viscosity should be submitted. All equations used in the analysis should be provided with the appropriate parameters substituted into the equations. Any abnormal data fluctuations should be explained. If the falloff test data is determined to be unanalyzable, a new test should be carefully planned and completed to obtain meaningful results.

TREATMENT OF SIGNIFICANT MOBILITY RATIO CHANGES

It is not unusual, in cases in which the viscosity of the historically injected fluid varies significantly from that of the formation fluid, for the resulting mobility ratio $(k/\mu)_w / (k/\mu)_f$

change (where the subscripts "w" and "f" refer to the waste and formation fluid, respectively) to be reflected in the falloff plot. This may be manifested by a change of slope. The radial flow portion of the derivative curve should also change and level to another value. Eliminating alternative geologic causes, such as a sealing fault, leads to the interpretation of this change in slope as representing the boundary of the two fluid banks.

The correct interpretation of this type of Horner plot proceeds by first calculating the radius of the historical waste plume volumetrically. This radius should then be used in the evaluation of the Horner plot to determine which fluid viscosity is appropriate for use in the analysis (waste or formation fluid).

$$r = \left(\frac{0.13368q}{\pi h \phi} \right)^{1/2}$$

where q = cumulative injection into completed interval only, gal
 r = estimated distance to waste front, ft
 h = interval thickness, ft
 ϕ = porosity, fraction
 π = approximately 3.14

The thickness of the injection interval should be justified. This should include the disclosure of the existence and top of any wellbore fill, and whether or not the injection interval is composed of hydraulically isolated units or a single massive unit. In certain instances, particularly when hydraulically isolated sands are present, it may be necessary to define the amount of flow entering the fill. In order to avoid interpretation problems, operators are encouraged to regularly clean any fill out of the wellbore.

The radius of investigation, r_i , should then be calculated and compared to the radius of the waste front in order to determine the predominant fluid through which the pressure transients were propagating. (Lee, J.: Well Testing, Society of Petroleum Engineers of AIME, Dallas (1982), page 15, Equation 1.47):

$$r_i = \left(\frac{kt}{948\phi\mu c_t} \right)^{1/2}$$

where r_i = radius of investigation, ft

WAT 18-6-5-9

2/28/90
Hoechst Celanese

January 23, 1990
IOC-24-90

Chemical Group
Bay City Plant
Hoechst Celanese Corporation
PO Box 509, FM 3057
Bay City, TX 77404-0509
409 245 4871

Mr. Ronald D. Crossland
Environmental Engineer
Underground Injection Control Section
U.S. Environmental Protection Agency
Region VI
Fountain Place
1445 Ross Avenue
Dallas, TX 75202-2733

RECEIVED
JAN 29 1990
EPA 6W-S
REGION VI

Vince
File

Subject: Submittal of the 1989 Mechanical Integrity Testing (MIT)
Report For WDW-14, 32, 49 and 110

Dear Mr. Crossland:

Enclosed herewith is a copy of the subject MIT report, prepared by Golden Strata Services, Inc. (GSS), for the Hoechst Celanese Chemical Group, Inc., Bay City Plant, Bay City, Texas four Class I Injection Wells: WDW-14, 32, 49 and 110.

This report is provided as our response to item #1 under Mechanical Integrity Tests on the January 9, 1990 Notice of Comments which states the following:

"The submitted radioactive tracer tests and pressure tests for all wells were performed in December of 1988. Celanese should submit information demonstrating that the wells continue to have mechanical integrity."

The mechanical integrity testing was conducted by GSS per procedures approved by Texas Water Commission (TWC). All of the wells demonstrated mechanical integrity as required by TWC Underground Injection Control Program and 31 TAC, Sections, 331.4 and 331.43.

Please contact me by telephone at (409)245-4871, Ext. 4197 if you have any comments or questions about the enclosed MIT report.

Yours very truly,
I. O. Coleman, Jr.
I. O. Coleman, Jr.

IOC/las
Attach.

WAT 18-6-5-9

Hoechst

cc: Mr. Oscar Cabra, Chief w/o Attach. Report
Underground Injection Control
U.S. Environmental Protection Agency
Region VI
Fountain Place
1445 Ross Avenue
Dallas, TX 75202-2733

Mr. Vincent Malott
Environmental Engineer
U.S. Environmental Protection Agency
Fountain Place
1445 Ross Avenue
Dallas, TX 75202-2733

Mr. Russell S. Kimble, Chief w/o Attach. Report
Hazardous and Solid Waste Enforcement Section
Hazardous Solid Waste Division
Texas Water Commission
P. O. Box 13087, Capitol Station
1700 North Congress Ave.
Austin, TX 78711-3087

Mr. Tom Roth, Chief
Underground Injection Control Section
Texas Water Commission
P. O. Box 13087, Capitol Station
1700 North Congress Ave
Austin TX 78711-3087

(4)

MEMORANDUM

Subject: Transmittal of RCRA Facility Assessment Evaluation

From: Erlece P. Allen, Chief
Technical Section (6H-CT)

To: William K. Honker, Chief
Permit Section (6H-CP)

Attached please find a copy of the following RCRA Facility Assessment Evaluation:

Facility Name: Celanese Chemical Company
EPA ID Number: TXD026040709

Please advise us if more information is required and/or if you need further assistance.

Attachment

cc: Sam Becker (6H-C)

RCRA FACILITY ASSESSMENT EVALUATION
PRELIMINARY REVIEW AND VISUAL SITE INSPECTION

(NO SAMPLING VISIT)

Region VI, Technical Compliance Section

FACILITY'S NAME(S): Celanese Chemical Company (Bay City)

EPA ID NUMBER: TXD026040709

ADDRESS: P.O. Box 509 Bay City, Texas 77414

LOCATION: Nine miles on FM 3057 Southeast of Bay City, Matagorda County, TX

DATE OF INSPECTION: May 11, 1987

SITE DESCRIPTION: Chemical Manufacturing Plant

PREPARED BY: TWC DATE PREPARED: September 8, 1987

REVIEWED BY: Jon Rinehart DATE REVIEWED: _____

ANTICIPATED PERMIT DATE: September 30, 1988

ANY ON-GOING STATE/FED 264, 265, or 270 CORRECTIVE ACTION OR CERCLA ACTION:

The State felt that there was a violation in the Part B.

EPA does not take that position. They felt that there was a LOIS violation

DOES FACILITY HAVE A CERCLA FILE? YES X NO _____

Was a CERCLA PA/SI performed at this facility: Yes February 1983

DOES FACILITY HAVE UIC WELL? YES X NO _____

TYPE OF DRINKING WATER SUPPLY WITHIN A 3-MILE RADIUS: There are twelve domestic water wells within one mile of the facility from the Chicot. One well is located downgradient. The public water supply is nine miles away in Bay City.

TARGET POPULATION WITHIN A 3-MILE RADIUS: The town of Bay City has a population of 17,984 as of the 1980 census, and is located nine miles from the facility. Approximately 300 people live within a three mile radius.

RECOMMENDATIONS: _____ S.V. X R.F.I. _____ I.M. _____ No Further Action under R

(Indicate only one unless I.M. is marked)

X 3004(u) _____ 3007

Possible Enforcement Action: _____ 3008(a) _____ 3008(h)

B. NUMBER OF SWMU INVESTIGATED DURING THE PR/VSI: 76

<u>LIST OF SWMU</u>		<u>REGULATED BY RCRA*</u>	<u>STATUS**</u>	<u>SUBJECT TO GWM SUBPART F</u>
1)	Boiler 4/5/6 (01)	Y	A	N
2)	F-4B (Class IH) Landfill (02)	Y	A	Y(?)
3)	F-8 (05) Landfill	Y	A/C	Y(?)
4)	WDW-14/32/49/110 (07) Injection Wells (2,3,4,1-A)	Y	A	N
5)	V-683 Boiler Oil Feed Tank (09)	Y	A	N
6)	Retention Pond (13)	Y	A	Y(?)
7)	V-159 Storage Tank (14)	Y	A	N
8)	V-680 Surge Tank (15)	Y	A	N
9)	V-248/V-987 Barge Dock Tanks(17)	Y	A	N
10)	V-901 Dirty Water Skimmer(18) Tank	Y	A	N
11)	Bulk Storage Area (19) Barrel Warehouse	Y	A	?
12)	Bulk Storage Area (20) Building 525	Y	A	?
13)	V-871 Surge Tank (21)	Y	A	N
14)	V-150 Prim. Filter Tank (X01)	Y	A	N
15)	V-151 "	Y	A	N
16)	V-833 "	Y	A	N
17)	V-152 Polish Filter Tank (X02)	Y	A	N
18)	V-153 "	Y	A	N
19)	V-662 "	Y	A	N
20)	V-663 "	Y	A	N
21)	V-1059 Prim. Filter Tank (X03)	Y	A	N
22)	V-1060 "	Y	A	N
23)	V-1061 "	Y	A	N
24)	V-1062 "	Y	A	N
25)	V-162 Polish Filter Tank (X04)	Y	A	N
26)	V-163 "	Y	A	N
27)	V-656 "	Y	A	N
28)	V-657 "	Y	A	N
29)	V-757 "	Y	A	N
30)	V-758 "	Y	A	N
31)	V-693 Neutralization Tank (X05)	Y	A	N
32)	M-1885 Well Sump (X06)	Y	A	N
33)	Emergency Storage Pond (X07)	Y	A	Y(?)
34)	V-877 Surge Tank (X08)	Y	A	N
35)	M-1897 Oil Sump (X09)	Y	A	N
36)	V-698 Tank (X10)	Y	A	N

* Y-Yes, N-No, ?-Unknown

** Active, Inactive, or Closed (A, I, or C)

*** GWM-Groundwater Monitoring

k = permeability, md
 t = time injected, hrs
 ϕ = porosity, fraction
 c_t = total compressibility, psi^{-1}
 μ = viscosity of fluid, cp

If it is determined that the pressure transients were primarily propagating through the waste plume, then the viscosity of the historically injected waste is the appropriate viscosity to use in the analysis. This may be the case for an older well with a long injection history and a large historical waste plume. It then follows that the proper viscosity to use in interpreting a well test in a relatively new well with little or no historical plume development would be that of the formation fluid. In either case, adequate information must be presented in order that the viscosity of the appropriate fluid, at reservoir conditions, can be verified.

If sufficient semilog straight line data exists on both sides of the slope change, then the use of the appropriate viscosities should produce approximately the same kh product for both sides of the slope change. If both slopes are analyzable, the kh product should be calculated and compared for both slopes.

APPROPRIATE FLOW RATE

In theory, the time required to achieve a particular radius of investigation is independent of flow rate. However, in practice, the flow rate must be large enough such that pressure changes with time can be recorded with sufficient precision to be useful for analysis.

HORNER PLOT ANALYSIS

The time determined at which the end of wellbore storage occurs should be converted to Horner time. This time approximates the point when the pressure transient has moved beyond the influence of the altered zone near the well and when wellbore storage has ceased distorting the pressure falloff test data. At this time the semilog straight line whose slope is related to formation permeability can be observed on the Horner plot. This straight line ordinarily will continue until the radius of investigation reaches one or more reservoir boundaries, massive heterogeneities, a fluid/fluid contact, or runs out of measurable pressure transients.

The slope of the Horner plot (m) is used to determine the (kh/μ) parameter group from the following equation:

$$\frac{kh}{\mu} = \frac{162.6qB}{m}$$

where: m = slope of the Horner plot, delta p/cycle
 q = injection rate, bpd
 B = formation volume factor, rvb/stb
 h = interval thickness, ft
 μ = viscosity, cp
 k = permeability, md

The interval thickness (h) used in the equation should represent only the formation interval influenced by injection. It should be realized that this value may periodically change. This thickness may be more or less than the completed interval, or that value employed in the petition demonstration, due to factors such as wellbore fill, wellbore damage, and completions that do not closely correspond to the full thickness of the interval.

PRESSURE DERIVATIVE ANALYSIS

The pressure derivative curve is a log-log plot of the change in slope of the semilog plot of pressure with respect to time. Although it may be employed for several reasons, such as the detection of the end of the wellbore storage period, and the detection of restrictive boundaries, the former case is the only purpose for which this tool will be employed in the analysis of the annual reports. Either the natural logarithm of time or Horner time may be employed. The derivative curve should be presented on a log-log scale with the pressure versus time plot superimposed. The derivative plot emphasizes the infinite acting radial flow portion of the test. This allows the start of this period to be readily identified. Characteristically, the end of the wellbore storage period (and consequently the beginning of the infinite acting radial flow period) can be identified by a flattening out of the derivative curve. The derivative plot allows a more accurate determination of this time period, in comparison with the traditional method of simply proceeding one and one half log cycles past the end of the unit slope line on the log-log plot of the pressure versus time data. The end of wellbore storage effects should be identified on the log-log and derivative plots.

COMPARISON TO PETITION DATA

A comparison between the falloff test results and the parameters used in the no migration petition demonstration should be made. Specifically, the following should be demonstrated:

1. The bottom hole pressure should be at or below that which was temporally predicted by the pressure buildup model.
2. It should be shown that the (kh/μ) parameter group calculated from the current falloff data is the same or greater than that employed in the pressure buildup modeling.
3. If in the original petition, the permeability calculated from falloff testing was employed in determining a background reservoir velocity, that permeability should be compared to that derived from the current falloff test.

REPORT FOR EPA

A detailed report should be submitted to Region 6 summarizing the results of the falloff test with the parameters used in the no migration demonstration. The static bottom hole pressure should be below that predicted by the pressure buildup model. The kh/μ parameter grouping and permeability values calculated from the falloff test should lie within the range used in the petition. The report should include all raw data, a discussion of the testing procedure, all graphs and calculations, interpretations and conclusions from the test, and a comparison of all parameters with those used in the petition demonstration including references where the parameters can be found in the petition. The comparison of parameters should include an evaluation of the impact of parameter changes on the no migration demonstration. The summary should include the following data:

A. Falloff Test Data

1) Pre-test period

Date of test
 Shut-in time prior to test
 Stabilized pressure and temperature prior to test
 Cumulative injection into completed interval
 Wellbore radius
 Completed interval
 Type of completion
 Depth to fill
 Justified interval thickness
 Average historical waste fluid viscosity

 Formation fluid viscosity
 Porosity
 Total compressibility
 Formation volume factor
 Initial formation bottom hole pressure and temperature

2) Injection Period

Time of injection period
Test fluid
Injection rate
Pumps used for test
Injection fluid viscosity
Method and times viscosity tested
Final injection pressure and temperature
Gauge type (Panex, Amerada, etc)
Gauge sensitivity
Gauge depth

3) Falloff Period

Total shut-in time
Final shut-in pressure and temperature

B. Calculated Test Data

Distance to waste front
Radius of investigation
Time to end of wellbore storage (from derivative)
Horner time at end of wellbore storage
Slope or slopes from Horner plot
kh/ μ
Permeability (range based on values of h)
Skin

TIMING OF REPORT SUBMISSION

The report discussed above is due at EPA Region 6 within one year from the date of petition approval. It will not be acceptable if have simply completed the testing by the deadline, without submission of a complete report. This does not mean that all correspondence between Region 6 and the facility must be settled by the deadline, but a complete report must have been received. In addition, this report should be submitted no later than 45 days following the test.

The deadline for successive reports will be in yearly intervals from the date of the original petition, and not from the date of the last test. In no case should the time interval between successive tests be less than nine months. This will ensure that the tests will be performed at relatively even intervals throughout the duration of the petition approval period. Operators can, at their discretion, plan these tests to coincide with the performance of their annual State MIT requirements as long as the above requirements are met.

Failure to submit a complete report by the appropriate date will be considered as a violation of one of the conditions of the petition approval and may result in revocation of the petition.

approval.

C. NUMBER SWMU TO BE INCLUDED IN
(Except RCRA units subject to

<u>LIST OF SWMU</u>	<u>MEDIA</u>
1) F-8 Landfill 05 (SWMU #3)	S GW SW
2) Landfill F-4A, C, D, 02 (SWMU #58)	S GW SW
3) F-1 Landfill 03 (SWMU #59)	S C S

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6. Proano, E.A. and Lilley, I.J
Application to Bounded Reser
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<u>LIST OF SWMU</u>	<u>MEDIA</u>	<u>RATIONALE</u>
4) F-2 and F-3 Landfill 04 (SWMU #60)	S GW SW	This unit is two landfills operated from 1962 to 1965 and closed in 1979. This unit has no artificial liner installed, no leachate collection system, runoff managed by plant runoff control system, 2-3 foot thick clay covers between lifts, and a final clay cover of 2-3 feet of clay with permeability of 10^{-7} to 10^{-9} cm/sec. The wastes managed at these landfills are: plant trash, water treater sludge, surface impoundment cleanout from surge pond and NPDES sump cleanout material, construction rubble, and sump cleanouts with spent copper chromite catalyst. No evidence of release was identified in the documents reviewed or during the VSI. Due to the construction and the hazardous waste that was handled in this unit the likelihood of a release to soil, groundwater, and surface water is high.
5) F-5 Landfill 06 (SWMU #61)	S GW SW	This unit is a landfill which has a clay bottom, no leachate collection system, runoff managed by runoff collection system, and covered by 2-6 feet of clay with 10^{-7} to 10^{-9} cm/sec permeability. The wastes that have been disposed of in this unit are: HMD (Carbadox) catalyst, and activated sludge Raney Nickel. No evidence of release was identified in the document search or during the VSI. The possibility of release to soil, groundwater and surface water is high.
6-9) Leveling, Surge and Settling Pond; Clean Water Skimmer 11 (SWMU #64, 65, 66, and 67)	S GW SW	This unit consists of a skimmer, three surface impoundments (leveling, surge, and settling ponds) used in conjunction with the Aeration Lagoons for NPDES

<u>LIST OF SWMU</u>	<u>MEDIA</u>	<u>RATIONALE</u>
		permitted treatment of process wastewater and contaminated stormwater runoff. The ponds do not appear to be lined with synthetic liners. The cooling tower blowdown contains chromium which has been disposed of in this unit. The likelihood of a release to soil, groundwater, and surface water is very high.
10-11) Aeration Ponds Primary, Secondary Lagoon 12 (SWMU #68 and 69)	S GW SW	This unit consists of two surface impoundments which were activated in 1963 and are still active. The units are permitted under TWC WQ 455 and NPDES TX006017 permits. No construction date was in the documents reviewed. The cooling water tower blowdown contains chromium, which has been disposed of in this unit. The sludges may also contain toxic levels of chromium, which may have released to soil, groundwater, and surface water.
12-13) BOD Ponds #1 and #2, Paddy Ponds Y01 (SWMU #73 and 74)	S GW SW	<p>The BOD Ponds #1 and #2 was constructed of native soils with an estimated working depth of 6 inches. The Paddy Pond was constructed of native soils with an estimated working depth of 6 inches. All three of the impoundments were closed in 1970 by allowing the impoundments to dry and then scrapping the accumulated solids into pits. These pits are located as follows: one each in the HW corner of BOD Ponds 1 and 2, and two in Paddy Ponds, one at the NE and one at the SW corner of the impoundment.</p> <p>No cover construction details were found. The wastes that were handled in these units were: acetaldehyde U001, chloroacetaldehyde P023, acetic acid U112, acetaldol, butanol U031, and crotonaldehyde U053, which were then disposed of in the injection well WDW-8.</p>

<u>LIST OF SWMU</u>	<u>MEDIA</u>	<u>RATIONALE</u>
		Contamination has probably occurred to soil, groundwater and surface water due to the unlined nature of the impoundments and the listed wastes disposed. The closure pits also need to be examined for soil contamination.
14) F-O Landfill Y02 (SWMU #75)	S GW SW	This unit is a landfill with a clay bottom and closed with a 2-3 foot cover of clay with a permeability of 10^{-7} to 10^{-9} cm/sec. The wastes that were disposed of in this unit was sump and tank bottom sludges and office trash. This unit was closed in 1970. This landfill was probably used to dispose wastes of similar nature to material disposed presently in Landfill F-4B which includes chromium and chromium compounds. The contamination that has occurred would be soil, groundwater and surface water. Soil samplings needs to be conducted.
D. <u>NUMBER OF SWMU WITH NO INDICATED RELEASES:</u> <u>60</u> (Documentation is necessary for a SWMU to be included in this category.)		

<u>LIST OF SWMU</u>	<u>RATIONALE</u>
1) Industrial Boiler 4/5/6 (SWMU #1) 01	This unit burns liquid hazardous wastes which may contain Appendix VIII constituents such as toluene, triphenylphosphine, isobutanol and butanol. There was no evidence of release in the documents reviewed or during the inspection.
2) F-4B Landfill (SWMU #2) 02	This unit handles process wastes, spent catalysts, contaminated dirt and sludges from sumps, containers and tanks chromium and chromium compounds are constituents which are included in these wastes. There was no evidence of release in the documents reviewed or during the inspection. RCRA regulated.

LIST OF SWMURATIONALE

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| <p>3) V-683 Boiler Oil Feed
Tank 09
(SWMU #5)</p> | <p>This unit is a carbon steel pressure vessel which is surrounded by a concrete process slab with trench drains. The vessel is also fitted with a relief valve which vents to the atmosphere. No stains or evidence of spills were noted during the VSI.</p> |
| <p>4) Retention Pond 13
(SWMU #6)</p> | <p>Celanese plans to initiate unit closure, as required under HSWA Provision 3005(j), by November 8, 1988. Since this a RCRA Regulated Unit, no groundwater release investigations under HSWA Section 3004(u) are required. Surface releases were not observed during the VSI. Ground-water monitoring is accomplished by four wells; the upgradient well is CBC-14 and the downgradient wells are CBC-5, CBC-16, and CBC-17.</p> |
| <p>5) V-248/V-987 Barge Dock
Run Down Tanks 17
(SWMU #9)</p> | <p>This unit consists of two carbon steel, unlined tank. The tanks rest on saddles on the sandy soil of the dock area. No signs of release were observed during the VSI and none were indicated in the file review.</p> |
| <p>6) M-901 Dirty Water Skimmer 18
(V) (SWMU #10)</p> | <p>This unit is a two celled, internally elevated below-grade, concrete vessel. The unit is designed, constructed and operated appropriately. No structural flaws or evidence of release were noted. In the documents reviewed no evidence of release was reported.</p> |
| <p>7) Bulk Storage Area 19
Barrel Warehouse (SWMU #11)</p> | <p>The unit is designed, constructed, and operated to safely handle spent catalyst material, which is a nickel catalyst. No evidence of release was documented during the file review or during the VSI.</p> |
| <p>8) Bulk Container Storage
Area 20 Building 525
(SWMU #12)</p> | <p>This unit is a pre-fabricated steel building set on a concrete slab at grade. The unit stores asbestos prior to disposal. There were no evidence of release during the VSI or in the file documents that were reviewed.</p> |

LIST OF SWMURATIONALE

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| 9) V-871 Acid Well Surge
Tank 21 (SWMU #13) | This unit is an atmospheric pressure cone-roof, 316 stainless steel vessel. Based on a review of all available information and a visual site inspection there is no evidence of release. |
| 10) V-150 Acid Well Primary Filter
Tank X01 (SWMU #14) | This unit consists of three pressure vessels. The vessels are set on individual raised concrete foundations surrounded by a concrete process area slab. No curbed secondary containment system is installed. There is no evidence of release during the VSI or in the files reviewed. |
| 11) V-151 Acid Well Primary Filter
Tank (SWMU #15) | " " |
| 12) V-833 Acid Well Primary Filter
Tank (SWMU #16) | " " |
| 13) V-152 Acid Well Polish Filter
Tank X02 (SWMU #17) | This unit consists of four pressure vessels. The vessels are set on individual raised concrete foundations surrounded by a concrete process area slab. No curbed secondary containment system is used. There was no evidence of release indicated in the documents reviewed or during the VSI. |
| 14) V-153 Acid Well Polish Filter
Tank (SWMU #18) | " " |
| 15) V-662 Acid Well Polish Filter
Tank (SWMU #19) | " " |
| 16) V-663 Acid Well Polish Filter
Tank (SWMU #20) | " " |
| 17) V-1059 Neutral Well Primary
Filter Tank X03 (SWMU #21) | This unit consists of four pressure vessels, which are set on individual raised concrete foundations surrounded by a concrete process area slab. No curbed secondary containment system is used. No evidence of release was documented in the files reviewed or during the VSI. |

LIST OF SWMU

- 18) V-1060 Neutral Well Primary Filter Tank (SWMU #22)
- 19) V-1061 Neutral Well Primary Filter Tank (SWMU #23)
- 20) V-1062 Neutral Well Primary Filter Tank (SWMU #24)
- 21) V-162 Neutral Well Polish Filter Tank X04 (SWMU #25)
- 22) V-163 Neutral Well Polish Filter Tank (SWMU #26)
- 23) V-656 Neutral Well Polish Filter Tank (SWMU #27)
- 24) V-657 Neutral Well Polish Filter Tank (SWMU #28)
- 25) V-757 Neutral Well Polish Filter Tank (SWMU #29)
- 26) V-758 Neutral Well Polish Filter Tank (SWMU #30)
- 27) V-693 Acid Well Neutralization Tank X05 (SWMU #31)
- 28) M-1885 Neutral Well Neutralization Sump X06 (SWMU #32)

RATIONALE

This unit consists of four pressure vessels, which are set on individual raised concrete foundations surrounded by a concrete process area slab. No curbed secondary containment system is used. No evidence of release was documented in the files reviewed or during the VSI.

" "

" "

This unit consists of six pressure vessels. The vessels are set on individual raised concrete foundations surrounded by a concrete process area slab with no curbed secondary containment system utilized. No evidence of release was identified during the review or the VSI.

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" "

This unit is a vessel that is equipped with 2 gooseneck vents for pressure control. The vessel is elevated 15 feet above grade but there is no secondary containment. There is no evidence of release documented in the file review or during the VSI.

This unit consists of concrete sump with an 8" overflow line. No evidence of release was documented in the file review or during the

LIST OF SWMU

- 29) Emergency Storage Pond X07
(SWMU #33)
- 30) Emergency Storage Pond Surge
Tank V-877 X08 (SWMU # 34)
- 31) M-1897, Oil Sump X09
(SWMU #35)
- 32) V-698, T-29 Overhead
Accumulator X10 (SWMU #36)
- 33) V-519, Neutral Well Waste
Oil Surge Tank X11 (SWMU #37)
- 34) V-1041, VA Waste Oil Tank
X12 (SWMU #38)

RATIONALE

This unit is a rectangular, diked pond with a working volume of 43 million gallons and covers 11 acres. The unit was constructed by shallow excavation of native clay soils. Ground water monitoring is accomplished with one upgradient well CBC-14, and three downgradient wells, CBC-3, CBC-11 and CBC-20. No evidence of release was noted during the file review or the VSI.

This unit is an unlined, stainless steel vertical vessel with a nominal working capacity of 17,600 gallons. No evidence of release was indicated in the documents reviewed or during the VSI.

This unit is a two celled, internally coated, below-grade, concrete vessel commonly known as the dirty water skimmer. Celanese has identified both cells with a vessel number, M-901 for the skimmer side and M-1897 for the oil retention side. There is no evidence of release documented in the file review or during the VSI.

This unit is an unlined, stainless steel horizontal vessel with 850 gallon nominal working capacity. It rests on a curbed process slab. There is no evidence of release documented in the file review or during the VSI.

This unit is a stainless steel horizontal vessel of a capacity of 25,000 gallons. There is no evidence of release identified in the documents reviewed or during the VSI.

This unit is an unlined, stainless steel vertical vessel with a nominal working capacity of 20,300 gallons. It is placed on a concrete process slab with 6" curb. There no evidence of release documented in the files reviewed or during the VSI.

LIST OF SWMURATIONALE

- 36) V-17, T-146 Overhead Receiver
X14 (SWMU #39)
- 37) Ditches A, B, and C X15
(SWMU # 40)
- 38) Purge Waste Acid Tank V-388
(SWMU #41)
- 39) M-1886 Lab Sump X19
(SWMU #42)
- 40) V-658, No. 2 Precoat Tank
X20 (SWMU #43)
- 41) V-681 No. 3 Clearwell Tank
X21 (SWMU #44)
- This unit is a rubber lined tank which is equipped with a relief valve, insulation and full level instrument control. There is no evidence of release identified in the review of the files or during the VSI.
- This unit consists of four below grade, unlined, ditches which are located throughout the operating plant site. The known waste constituents are isobutanol, vinyl acetate, and acetic acid. Release to soil and ground water may have occurred from this TWC feels that the monitor wells already installed should intercept any possible contaminants.
- This unit consists of an unlined, stainless steel tank vertically oriented with 5,075 gallon capacity. Celanese intends to close V-388 under interim status regulations. There is no evidence of release identified from the documents reviewed or during the VSI.
- This unit is a stainless steel vaulted sump. The sump has a fixed cover with a full instrument level controls. No evidence of release was identified in the file review or during the VSI.
- This unit is an unlined, carbon steel tank vertically oriented with a nominal capacity of 1500 gallons. As of June 1984, the unit was no longer in service. Celanese is planning to close this unit under interim status. No evidence of release was indicated in the file review or during the VSI
- This unit is a galvanized, carbon steel, vertical steel with a nominal working capacity of 35,200 gallons. No evidence of release was identified in the documents reviewed or during the VSI.

LIST OF SWMURATIONALE

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| 42) V-682, No. 3 Precoat Tank X22 (SWMU #45) | There were no unit design data included in the documents reviewed. No evidence of release was identified in the file review or during the VSI. This unit has been scheduled for interim status closure. |
| 43) V-708 Clarifier Tank X23 (SWMU #46) | This unit consists of two vessels, V-708 and V-793, with 79,310 and 6,768 gallon capacity respectively. There is evidence of release identified in the documents reviewed or during the VSI. |
| 44) V-793 Cone Bottom Settler Tank (SWMU #47) | " " |
| 45) V-761, No. 4 Tank X25 (SWMU #48) | This unit is an unlined, carbon steel vertical tank with nominal capacity of 1,682 gallons. No evidence of release was identified in the documents reviewed or during the VSI. This unit has been inactive since June 1984 and has been scheduled for interim status closure. |
| 46) V-778 CHOX H ₂ O/Oil Separator X26 (SWMU #49) | This unit is an unlined stainless steel horizontal tank with nominal capacity of 23,385 gallons. There is no evidence of release documented in the files that were reviewed or during the VSI. |
| 47) V-792, Sulfuric Acid Waste Tank X29 (SWMU #50) | This unit is a rubber-lined, carbon steel vessel. No evidence of release was identified in the documents reviewed or during the VSI. |
| 48) V-1035, SFA Catalyst Tank X30 (SWMU #51) | This unit is an unlined, stainless steel tank with a nominal capacity of at least 75,000 gallons. It does not have a surrounding process slab. No evidence of release was identified in the documents reviewed or during the VSI. |
| 49) V-1042, Waste Oil Surge Tank X30 (SWMU #52) | This unit is an unlined, stainless steel tank with a nominal capacity of 1,600 gallons. No evidence of release was identified in the documents reviewed during the VSI. |

LIST OF SWMURATIONALE

- 50) V-1043, CHOX Oil/Water
Coalescer X32 (SWMU #53)

This unit is an unlined, stainless steel, horizontal tank with nominal working capacity of 283 gallons. This unit is no longer in service as of June 1984 and has been scheduled for interim status closure. No evidence of release was identified in the documents reviewed or during the VSI.

- 51) M(V)-1881, Area I Sump X33
(SWMU #54)

This unit is a concrete sump with a street cover. It has a capacity of 2334 gallons. No evidence of release was identified in documents reviewed or during the VSI.

- 52) V-1882, ADA-Nylon Salt Sump
X34 (SWMU #55)

The unit is a thick-walled concrete sump, which is not covered. No evidence of release was identified in the documents reviewed or during the VSI.

- 53) V-1883, CHOX Sump X35
(SWMU #56)

This unit is a concrete sump with a steel cover. It has a capacity of 2334 gallons. No evidence of release was identified in the documents reviewed or during the VSI.

- 54) Liquid Incinerators 1 and 2
X36 (SWMU #57)

This unit was shut down but remains standing. No evidence of release was identified in the documents reviewed or during the VSI.

- 55) F-9 Landfill (08)
(SWMU #62)

This unit was never built but was recommended by TWC for a RFI. After a conversation with Rex McDonnell III (permits writer) he said that this unit should be under "No Further Action".

- 56) F-7 Open Pit Incinerator
10 (SWMU #63)

This unit is a forced air burning pit with cage enclosure. No evidence of release was observed during the VSI or identified in the documents that were reviewed.

- 57) Day Chemical Warehouse 16
Container Storage Area
(SWMU #70)

This unit is in a large shipping/receiving warehouse. The unit is designed constructed and operated to safely handle catalyst material. No evidence of release was identified in documents reviewed or during the VSI.

LIST OF SWMURATIONALE

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| 58) V-782 Brine Tank X27
(SWMU #71) | These units are tanks which are served to store brine used in the injection well annulus leak detection system. No evidence of release was identified in the file reviewed or during the VSI. |
| 59) V-783 Brine Tank X28
(SWMU #72) | " " |
| 60) Injection Well WDW-8
(SWMU #76) | This unit was operated from from 1964 to 1973 when it failed due to "metallurgical failure". The unit has been referred to UIC. |

- E. SUPPLEMENTAL INFORMATION ON RCRA REGULATED UNITS: 4
(Describe any problems identified or suspected from regulated units including identified releases to groundwater)

LIST OF SWMUCONCERNS

- | | |
|--|--|
| 1) F-8 Landfill 05 (SWMU #3) | This unit has received asbestos, Dirty Water Skimmer sludge which included listed wastes: formaldehyde U122, acrylic acid U008 formic acid U123 trichloroethane F001, acetone F003, methanol F005, and MEK U159. These wastes were indicated in Inspection 5 and 6 which were a CERCLA Site Investigation and a CMI conducted by TDWR respectively. It appears that this unit may have lost interim status since it was not included in the Part B permit application. This unit has been referred to the TWC Enforcement Section for appropriate L.O.I.S. action. The TWC subsequently passed the case to EPA for action. |
| 2) Injection Wells (SWMU #4)
WDW-14/32/49/110 | WDW 14/32/49 were permitted to dispose of wastes with the following compositions, hexanols, hexamethylene imine, ammonia, cyclohexane, amyl alcohol, nitric acid, maleric acid, nylon salt, sodium nitrite, sodium nitrate, sodium bicarbonate, sodium carbonate, methanol, dodecane, and hexamethylene diamine. WDW-110 was permitted to dispose of wastes with the following components: copper, |

LIST OF SWMUCONCERNS

- vanadium, nitric acid, chlorinated organics, acetic acid, methyl acetate, acetaldehyde, C₁-C₆ hydrocarbons, cyclohexane, cyclohexanone, and cyclohexanol. The wells appear to be operated with no indication of release. Inspection 11 of Attachment B.3 of the RFA Report indicated WDW-32 and WDW-49 are failing to maintain a properly functioning annulus leak detection system. This issue should be referred to the UIC program.
- 3) V-159 Storage Tank 14 (SWMU #7)
- This unit is an atmospheric, cone roof carbon steel vessel. Based on other similar vessels nearby, it is not likely that this unit has a curbed, concrete secondary containment structure; rather the unit relies on trenches in the fully-surrounding concrete process area slab for spill control. No problems were indicated in the file review or during the VSI.
- 4) V-680 Neutral Well Surge Tank 15 (SWMU #8)
- This unit is an atmospheric pressure, cone-roof, carbon steel vessel. Based on other similar vessels nearby, it is not likely that this unit has a curbed concrete secondary containment structure; rather, the unit relies on trenches in the partially surrounding concrete process area slab for spill control. Based on the review of all information and the visual site inspection of this unit no problems were indicated.

II. FINDINGS

A. RECOMMENDATIONS:

The State recommends that the following units be included in a RFI: 1) Landfill F-4A, C, D 02 (SWMU #58); 2) Landfill F-1 03 (SWMU #59); 3) Landfill F-2, 3 04 (SWMU #60); 4) Landfill F-8 05 (SWMU #3); 5) Landfill F-5 06 (SWMU #61); 6) Landfill F-9 08 (SWMU #62); 7) Surface Impoundment Leveling Pond, Surge Pond, Settling Pond, Tank Skimmer 11 (SWMU #64, 65, 66, and 67); 8) Surface Impoundment Aeration Lagoons, Primary and Secondary Lagoons 12 (SWMU #68 and 69); 9) Surface Impoundment BOD Ponds 1 and 2 Paddy Ponds Y01 (SWMU #73 and 74) and 10) Landfill F-0 Y02 (SWMU #75).

The EPA concurs with the recommendations of the State on the SWMUs to be included in the RFI. F-9 08 Landfill was recommended by the State for a RFI but it appears that this unit was never built as a landfill. Therefore no further action is recommended. This was confirmed by a conversation with Rex McDonnell III on December 2, 1987.

B. Additional Comments:

The following units V-119, V-122, and V-123, which are T-107 Residue Storage. These units were originally listed as SWMUs but it has been determined that they serve as process stream storage and therefore are not SWMUs.

Unit V-710 OH Receiver X24, which was listed as a SWMU. It has been determined during the VSI that this handles process product and not waste material.

Unit F4A, C, D + Sump 02 (SWMU #58) was recommended by the State for a RFI to confirm the adequacy of the GWM program according to the following checklist:

1. Well Location (upgradient, downgradient, depth) confirmation of geology/hydrogeology (logs, borings, etc.)
2. Well Installation/Completion
Confirmation of construction including screened interval
3. Monitoring Data
 - A. Confirmation of indicator parameter adequacy
 - B. Review of past sampling data

The unit F-1 Landfill 03 (SWMU #59) requires the same information as SWMU #58 F-A, C, D + Sump Landfill. This information needs to be assembled for further evaluation. No evidence of release in either the document search or during the VSI.

Injection well WDW-8 (SWMU #76) was operated from 1964 to 1973 when it failed due to "metallurgical failure". This well was plugged in 1973. This well was permitted to dispose of wastes with the following composition: acetaldehyde, chloroacetaldehyde, acetic acid, acetaldol, water, butanol, and crotonaldehyde. The manner in which this well was plugged should be investigated. It has been referred to UIC. This unit is to be addressed under corrective action scheduled for December 1, 1987, by TWC.

M-1907 Area I Tank Farm Sump X17 had no information available on the description of this unit. It is no longer in the plant. No evidence of release was identified in the plant. No evidence of release was identified in the documents reviewed and because it is no longer present at the facility it could not be inspected during the VSI.

Purge Waste Acid Tank V-387 is an unlined stainless steel tank vertically oriented. This unit was decontaminated and sent to the Celanese Clear Lake facility in 1982

CONCUR: LYDIA M. BOADA CLISTA

DATE: 12\24\87